Electronic Services - Los Angeles

BMI

REFERENCE INFORMATION

POWER EVALUATION SOFTWARE

WILSON JONES
REDI-COVER®
447-13B
GENUINE PRESSBOARD
MADE IN U. S. A.

Power Evaluation Software User's Guide

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1 Getting Started

Menu Descriptions

All of the PE Software menus are self-supporting. The menus are designed so that detailed knowledge of DOS and Windows is not required in order to use the software.

Some Windows and DOS standard terminology is used throughout this document. An attempt has been made to define these terms when they're used for the first time. The Microsoft Windows® User's Guide section titled *Windows Fundamentals* may be useful reading for the first-time PC user or someone who isn't familiar with basic Windows terminology.

Startup Screen

After double-clicking on the Power Evaluation Software (PE Software) icon, the PE Software startup screen appears as shown in Figure 1.

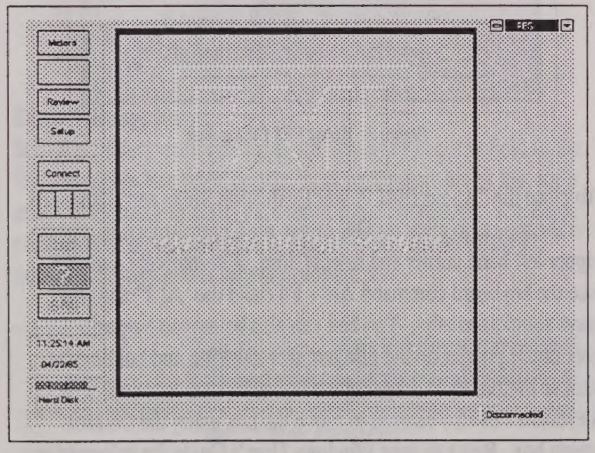

Figure 1: PE Software Startup Screen

The PE Software Startup Screen consists of the Main Toolbar, the Mode Buttons, the Time, Date, and Disk Status displays, the Error Message Bar, and the Communications Status Bar. The toolbar and the buttons and displays within it remain unchanged and accessible at all times while you're in the PE Software display. The main display area in the center of the display and the supplemental toolbar on the right side of the display change depending on which mode and function of the PE Software is selected. At startup, the supplemental toolbar area is blank. The minimize button in the upper right-hand corner of the display can be used to reduce the PE Software window to an icon while the PE Software remains active. While open, the PE Software display screen is fixed and cannot be re-sized. The display can be moved if your Windows environment is using the Super VGA display mode, but it will fill the entire screen and can't be moved if you are using the regular VGA display mode. Simultaneously pressing the "Alt-Tab" or "Ctrl-Esc" keys allow you move back and forth from the PE Software screen to other Windows applications. For more information on VGA and Super VGA display modes, or information on moving among Windows applications, refer to your Microsoft Windows® User's Guide.

The main sections of the PE Software Display are shown in Figure 2.

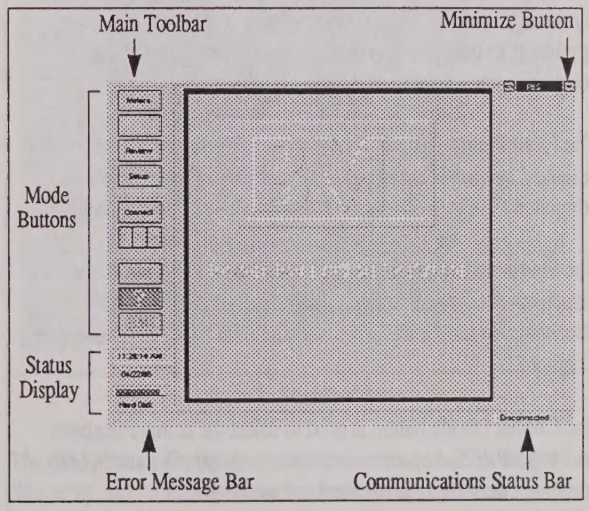

Figure 2: PE Software Display Elements

Main Toolbar

The Main Toolbar is located on the left side of the Startup Screen. The Main Toolbar consists of ten Mode Buttons and the Time, Date, and Disk Status Displays.

Getting Started

1

Mode Buttons

Selecting a Mode button causes the display and options specific to an area of PE Software operation to appear on the display. All other unrelated options and selections don't appear on the display, making the operation of the PE Software simple and intuitive.

The **Meters** mode button is used to display real-time values of V, I, W, VA, VAR, PF, dPF, and voltage and current THD for all channels of a BMI power analyzer. The values that can be displayed are dependent on the measurement mode of the instrument.

The second mode button is blank and cannot be accessed. This button is present to support future capabilities and has no function in this release of PE Software. (Note that other buttons in the PE Software display may be dimmed when a function is not applicable to the operation you are performing or when that function is not yet supported in PE Software.)

The **Review** mode button is used to view and analyze data already collected by your BMI Power Analyzer and transferred to your computer. The Review mode is covered in detail in Chapter 6 .

The **Setup** mode button is used to configure the PE Software display environment and to create site information and set thresholds for individual instruments. Setup mode is discussed in Chapter 3.

The **Connect** mode button is used to select the communications port and either dial up an instrument connected via modem or to communicate with an instrument connected via RS-232. The Connect mode is discussed in Chapter 2.

The **Q**, **F**, and **H** mode buttons are used to configure the measurement mode of the instrument for capturing power quality disturbances, steady-state power flow information, or harmonics analysis. (Note: Each of these software packages are sold separately and all of them may not be available on some units.)

The "keyboard" mode button allows you to make text and other keyboard entries using your mouse and a software-generated pop-up keyboard on your display. The keyboard function is not supported in this release of software.

The "question mark" mode button is used to enter the Windows **HELP** function for PE Software. This button is context sensitive and **HELP** information on the area of the PE Software you are presently using will appear first. See the Microsoft Windows' User's Guide for more information on how to use the Windows' **HELP** function.

Selecting the "BMI Logo" mode button will display a dialog box that lists the revision level of PE Software that you are using as well as the address and phone number for BMI. This dialog box is shown in Figure 3.

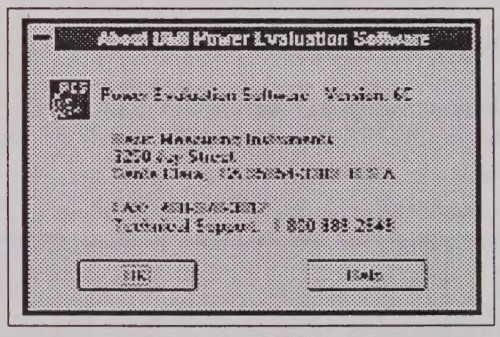

Figure 3: About PES Dialog Box

To close the "About BMI Power Evaluation Software" dialog box, use the mouse to click on **OK** or use the Control-menu box in the upper left hand corner and select Close. Alternatively, you can use the keyboard command **Alt + F4** (hold the 'ALT' and 'F4' keys simultaneously). The box can also be moved by positioning the mouse pointer on the title bar, then clicking and holding the mouse button while dragging the box to its new location. The keyboard can also be used to move the box using the Control-menu box. Refer to your Windows User's Guide for information on how to use the keyboard to select menu commands.

1 Getting Started

Status Display

The Status Display section located in the lower left-hand corner of the PE Software screen shows the present time and date, and contains a bar graph that indicates what percentage of the available space on your PC's disk drive is full. The Status Display area is shown in Figure 4. To set or change the time and date using PE Software, see Chapter 5. The time and date can also be set using the DOS time and date commands. Refer to your DOS User's Guide or to **DOS HELP** for more information. For information on archiving and deleting PE Software data from your disk, see Managing a Database in Chapter 10 of this User's Guide.

Figure 4: PE Software Status Display

Error Message Bar

Self-explanatory error messages are displayed in a text field in the Error Message Bar when certain input parameters aren't met for a selected action or to assist the user in some operations. The Error Message Bar is located at the lower left-hand corner of the PE Software display and is shown in Figure 5.

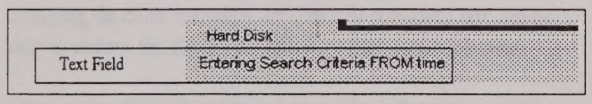

Figure 5: Error Message Bar

Communications Status Bar

The Communications Status Bar is located at the lower right-hand corner of the PE Software display, shown in Figure 6. This text field indicates whether or not the PC running PE Software is connected to an instrument, and whether the instrument is transmitting or receiving data from the instrument. For more information on communications between PE Software and an instrument refer to Chapter 2, "Connecting to a Power Analyzer", and Chapter 4, "Retrieving Data From a Power Analyzer".

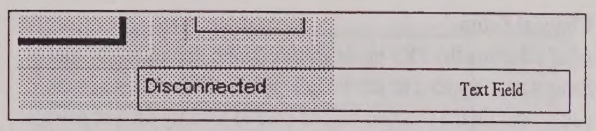

Figure 6: Communications Status Bar

Setting Up the PE Software

To configure the PE Software environment, use the mouse to select the **Setup** mode button. The PE Software display screen will then show the toolbar for **Setup** on the right-hand side of the display as shown in Figure 7.

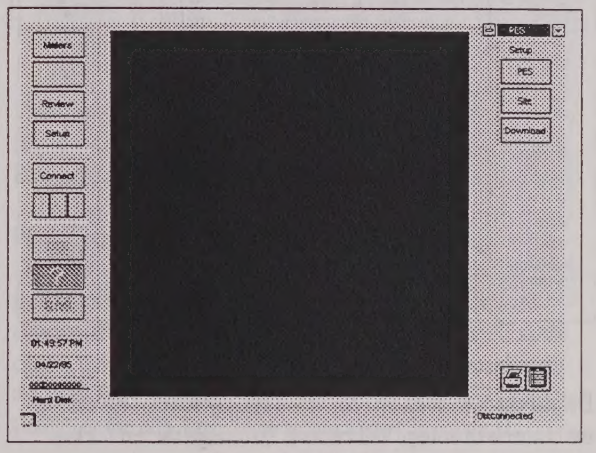

Figure 7: Setup Tool Bar

The PE Software display contains three selections: **PES** setup, Site setup, and automatic **Download** setup. Icons for printing setup information and for copying setup information to the Windows' clipboard are also included in the setup display.

Use the mouse to select the **PES** button to enter the software menus for setting up the PE Software display environment. The **Site** button is used to configure the monitoring instrument and is discussed in Chapter 4. The **Download** button is used to manage automatic, unattended downloads from instruments.

Channel Setup

After selecting the **PES** mode button, the PE Software Channel Setup screen appears as shown in Figure 8. This screen allows you to specify the text that will be used to identify each of the voltage and current channels and select colors for displaying and printing the data associated with each of the channels. (Note: If you are in the Power Flow mode, the phase channel display will be slightly different.)

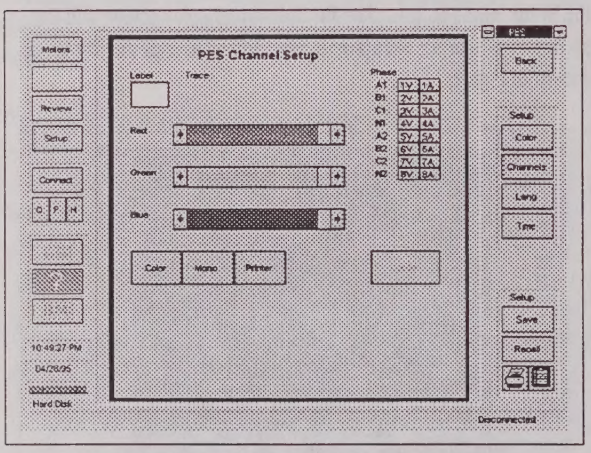

Figure 8: PE Software Channel Setup Screen

Default channel labels and colors are already selected for each of the channels of voltage and current. To change the text for the label, simply select the box under Phase for the channel that you wish to change using the mouse, then type the name of the new label for that channel in the Label text box (to type in the text box, you must first click on the box with the mouse). Click on the **Modify** button to make the change in the label. Continue to select each channel, type in the text and click the **Modify** button until you have assigned the text for each channel.

Note that two sets of eight channels are available in the screen (three sets of five in Power Flow mode). The first set of four voltage and four current channels (and the second and third set of five channels in Power Flow mode) are used with hardware supported with this version of PE Software. The second set of four voltage and four current channels are reserved for future use. The color defaults for the data display of the PE Software should allow you to differentiate between different channels in the display or on a print-out If you can't differentiate the channels on your display or printer, you can change the color settings.

To change the color used to display the data for each of the channels, select the Color button to set the color for a color VGA monitor or the **Mono** button to set the color for a black and white monitor. Next use the mouse to select the channel you wish to set the color for. The color already assigned to that channel appears in the screen as a line identified as **Trace**. Move the scroll box in each of the scroll bars marked Red, Green, and Blue until you get the color you wish to assign to that channel, then click on the **Modify** command box to assign the change to the channel.

To change the printer colors for each of the channels, select the Printer command box, then assign the color you wish to use for each channel as described above. (*Note: The gray scales used to print on a black and white printer are also modified when you change the Printer colors.*)

After you have assigned the labels and the colors that you wish to use for each channel, you should store the setups using the Save command box.

If you leave the Setup screen before you save the color and label assignments, the defaults will appear when you re-enter the setup screen and you will have to input the label and color information again. See Page 1-6 for detailed instructions for using the Save function.

Color Setup

In addition to assigning the labels and colors for the data displayed in PE Software, the colors of the different elements of the PE Software screen can be modified. To change the PE Software screen colors, use the mouse to select the Color button under Setup while in the PES Setup mode. The PES Color Setup screen will be displayed as shown in Figure 9.

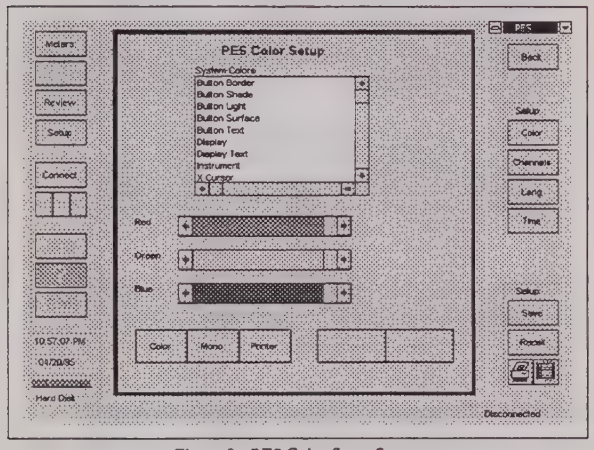

Figure 9: PES Color Setup Screen

The colors of each of the screen elements can be changed for a color monitor, black and white monitor, or for a printer. Select the screen element you wish to change in the **System Colors** box, then use the same procedure described in the previous section to change the color of each of the screen elements. In addition to changing the color manually, the **Default** command box can be used to restore the factory set color for each screen element.

After you're finished making changes, don't forget to save the changes.

Language Setup

The **Lang** command box is used to change the default language used in the PE Software displays. The PES Language Setup screen is shown in Figure 10.

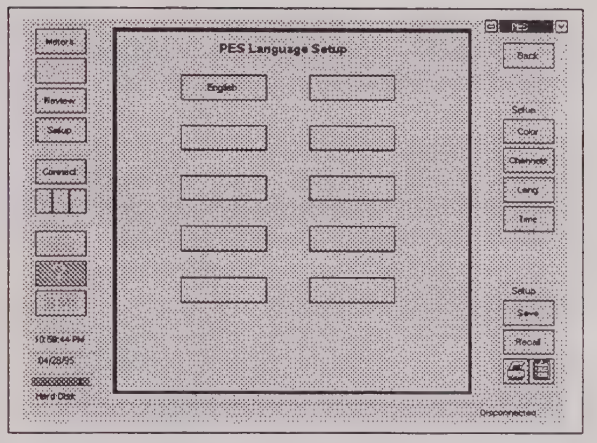

Figure 10: PE Software Language Setup Screen

This version of PE Software only supports English; other languages may be added in future releases of software. Contact BMI for the availability of a specific language.

PE Software Clock Setup

The PE Software keeps track of the current time and date to facilitate data reviewing and report generation. The software automatically uses the time and date that is set on your PC as the current time and date. To change the time and date, you can use the **DOS Time** and **Date** commands (refer to your DOS User's Guide), or the PES Time Setup screen, shown in Figure 11.

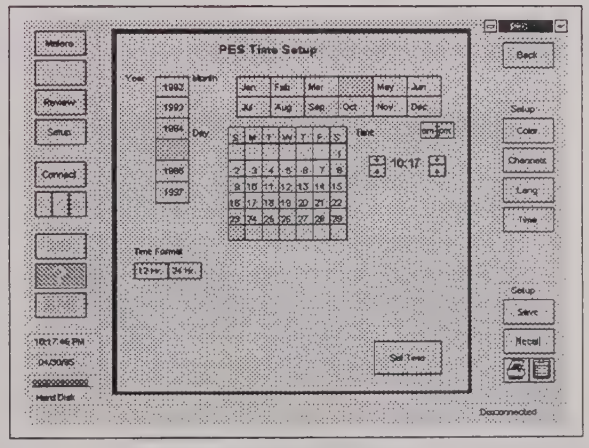

Figure 11: PES Time Setup Screen

To access the Time Setup screen, click on the Time command box while in the PES Setup mode. The time and date that are currently set on your PC will appear on the screen.

To change the date on your PC, simply click on the correct year, month, and date using your mouse. Click on the **Time Format** button to choose a 12-hour time format or 24-hour time format, then click on the up/down arrows to change the hour and minutes. When using the 12-hour time format, you must also select the appropriate **AM** or **PM** box.

After entering the current time and date, the PE Software will actually change the PC time and date when you click on the **Set Time** command box. If you leave the PES Time Setup screen before clicking on the **Set Time** box, the time and date won't be changed.

Saving and Retrieving PE Software Setup Information

After the PE Software Color, Channels, and Language setups are established, they must be saved using the **Save** function in order to use them again after exiting PE Software. Likewise, when entering the PE Software, previously established setups can be used by selecting them with the **Recall** function.

To save PE Software Setups, click on the **Save** command box. The Save PES Setup dialog box, shown in Figure 12, will appear in the screen. Position the cursor in the text box using the mouse, then type in a filename with up to eight characters. After typing in the filename, click on the **OK** command button to save the setup and return to the PES Setup.

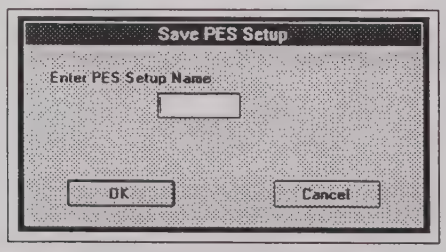

Figure 12 - Save PE Software Setup Dialog Box

The **Cancel** command box can be used to abort the save operation and return to the PES Setup screen you were previously in.

Click on the **Recall** command box to restore a previously saved setup. The Recall PES Setup dialog box, shown in Figure 13, will appear in the screen. A list of all setups that have been saved will be shown in the dialog box. Click on the name of the setup your wish to recall, then click on the **OK** command box.

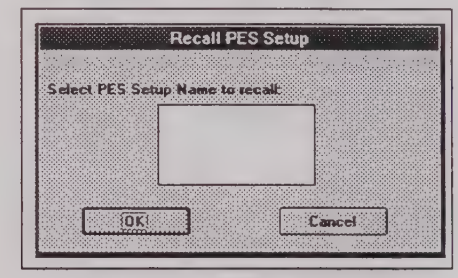

Figure 13: Recall PE Software Setup Screen

The **Cancel** command box can be used to abort the recall operation and return to the PES Setup screen you were previously in.

Printing and Exporting PE Software Setup Information

A text file containing the detailed setup information for the setup in use can be printed or copied to a word processor or editor using the Print or Export functions The Print and Export command boxes are always present in the lower right-hand corner of the PES Setup screen, as shown in Figure 14.

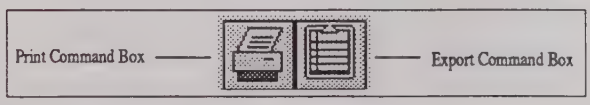

Figure 14: PE Software Print & Export Setup Command Box

To print the current setups, click on the Print Command Box. The setup file will automatically be printed to the default printer selected in your Windows control panel. The text in the setup file will show the position of each the color scroll boxes for each of the screen colors, the name and position of the color scroll boxes for each of the channels, and the language selected.

The color scroll boxes have 256 possible positions in the scroll bar. The text file describes the position of each of these boxes, where position 0 is the left-most position, position 255 is the right-most position, position 128 is the center position, etc. This information can be used to re-create the setups from one system to another or when recovering from accidentally deleting the system files or from a disk crash.

To export the setup data as a text file, click on the Export Command Box. The text file will be copied into the Windows Clipboard, and can be pasted into any Windows' word processor or editor.

Getting Started

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2 Connecting to a Power Analyzer

Introduction

After a BMI Power Analyzer has been connected to your PC with an RS-232 cable or modem, you are ready to contact the instrument with the PE Software. To connect to the Power Analyzer, click on the Connect command box. The Instrument Connection dialog box will appear in the screen as shown in Figure 15.

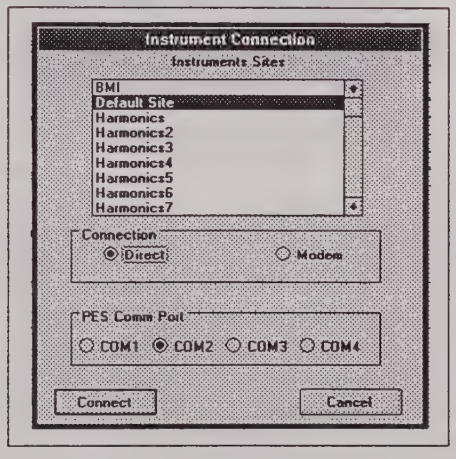

Figure 15: Instrument Connection Dialog Box

Making the Instrument Connection by Site Name

The Instrument Connection dialog box contains a list of the sites that have previously been defined using PE Software Site Setup. Click on the site name for the instrument you are connected to or the site name with the setup information you wish to use. Then select Direct radio button in the Connection field if your are using RS-232 communications or the **Modem** radio button if you are using modems. Next, select the communication port in the **PES Comm Port** field that the RS-232 cable or modem is connected to by clicking on the appropriate radio button. Finally, click on the Connect command box. The PE Software will then attempt to communicate with the instrument. The **Cancel** command can be clicked at any time prior to making a connection to the instrument to stop the connect operation and close the Instrument Connection dialog box.

If the connection is successful, then **"Connected"** will appear in the Communications Status Bar.

When attempting to connect to an instrument, the PE Software compares the instrument setup in the PE Software to the setups in the instrument. If they match, the connection is made. If they don't match, the Connect Setup Dialog box will appear in the screen, as shown in Figure 16.

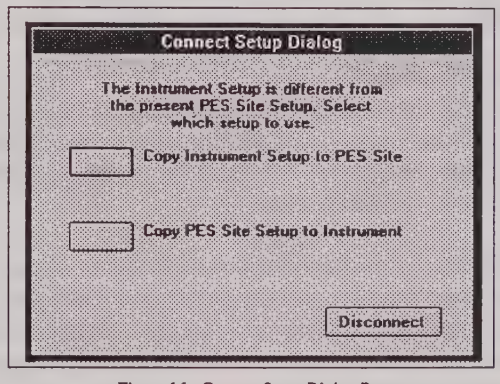
Connect Setup Dialog
The Instrument Setup is different from the present PES Site Setup. Select which setup to use.
Copy Instrument Setup to PES Site
Copy PES Site Setup to Instrument
Disconnect

Figure 16: Connect Setup Dialog Box

This dialog box provides three options for dealing with setups that don't match:

- The instrument setup data can be copied from the instrument into the PE Software. This is useful when you're contacting a unit that is in service from PC that's not normally the host computer, or if you suspect the software settings in the PC or the instrument have been tampered with. The PE Software Name, Threshold, and Memory setups will be modified to match those in the instrument.

- The PE Software setup data can be copied from the PE Software to the instrument. This command is useful when you're setting up the instrument thresholds the first time or when changing the thresholds for a new site.

If you copy PE Software site setup data to the instrument, any data that exists in the instrument will be erased. If you want to save this data, you must transfer the data from the instrument to the PE Software first.

Connecting to a Power Analyzer

- You can terminate the attempt to connect by clicking on the **Disconnect** command box with the mouse. This will abort the communication attempt, close the **Connect Setup Dialog** box, and return to the previous screen.

Direct Connection

To communicate via RS-232, use only the BMI-supplied RS-232 cable. Other RS-232 cables may require a null modem to work properly. Make sure that the communication port selection is correct.

Modem Connection

To connect with modems, the telephone number for the unit you are calling and optional initialization strings must first be specified in the **Name Setup** screen of the **Setup Site** function. See Chapter 3 to learn more about the screen.

It is important to make sure that you have the correct cable to connect your modems to the PC and to the instrument. Check your modem user's guide for the correct cable type, and make sure the communications port assignment in the **Instrument Connection** dialog box is correct.

Displaying Real Time Meters

When connecting an instrument to power, it is useful to view real time meters to insure that the connections are made properly. All phase of voltage and current must match up properly for proper power flow calculations (i.e., phase A voltage and phase A current must be connected to adjacent channels, etc.). It is also important to make sure that current transformers (CTs) are connected with the proper polarity. When making power flow measurements, negative power may indicate that one or more CTs are reversed or that voltage and current phases are not matched on adjacent channels.

To place the PE Software in Meters Mode to display real time measured values (when connected to an instrument) press the **Meters** mode button from the Left Toolbar. The Meters display will appear as shown in Figure 17.

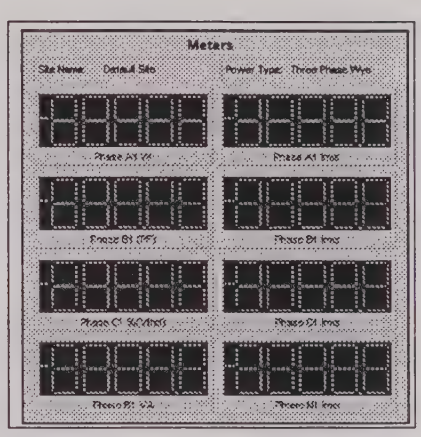

Figure 17: Meters Display

The PE Software Meters screen has 8 seven-segment displays that can be setup to display any combination of instrument channels and measurement types. Valid instrument channels will depend on the Power Type and Instrument Type for the connected instrument. Valid measurement types depend on the Instrument Mode for the connected instrument and include: Volts RMS (Vrms), Current RMS (Irms), Watts (W), Power Factor (PF), Displacement Power Factor (dPF), Voltage THD (Vthd), Current THD (Ithd), and Volt-Amps Reactive (VAR). The Right Toolbar contains the controls to select the desired instrument channel to measure and the type of measurement to be taken. The seven-segment displays indicate the channel and measurement type as text in its title bar beneath the display.

For measurement values below 1000.0, the seven-segment displays contain 4 significant digits and 1 precision digit. The PE Software will automatically scale measurement values, in which case the title bar at the bottom of the display will prefix the measurement type with a letter K for values over 9999.9 and a M for values over 999,999.9. When a measurement value is scaled, the number of significant and precision digits change to keep as many significant digits as possible without losing precision. For example, the value 10234.0 will be displayed as 10.234 K.

The following summarizes the measurement types that are valid for each Instrument Mode:

Power Quality Mode:	Volts RMS (Vrms) and Current RMS (Irms)
Power Flow Mode:	All measurement types in the display bar
Harmonics Mode:	No measurement types are available for display

Each of the seven-segment display contain 3 states, which is changed by clicking the left mouse button on the lower title bar of the seven-segment display. The seven-segment display states are defined as follows:

OFF	display is all black
ON	displays numeric values shown in bright green or red (for out of threshold values) when connected to an instrument
DIMMED	displays all segments in toned green and indicates display is in setup mode

To set up a seven-segment display, click the left mouse button on the title bar at the bottom of the seven-segment display until the display is in a **DIMMED** state. The Right Toolbar will reflect the current channel and measurement type for the seven-segment display. This is also displayed as text in the title bar at the bottom of the seven-segment display. To change the measurement type, select an enabled measurement type from the **Display** button in the Right Toolbar. To change the measurement channel, select an enabled channel from the channel buttons in the Right Toolbar. To update the display with measured values (only while connected to an instrument), click the left mouse button on the title bar until the seven-segment display is in the **ON** state.

Each of the eight seven-segment displays can be setup to display any measurement type and channel in the same fashion using the above procedure. Each seven-segment display setup is maintained once the PE Software is exited. In the event that the connected instrument does not support a channel or measurement type that is setup in the seven-segment display, the display will be shown in the **OFF** state.

When connected to an instrument that is in Power Quality Mode and the Vrms measurement is being displayed, the measured values are compared against the setup thresholds. Measured values that are not within the threshold limits are displayed in bright red. Measured values that are within threshold limits are displayed in bright green.

When measured values go outside of the setup thresholds, these events are counted by the PE Software. To display the number of times the measured values have gone out of threshold, click the right mouse button on the title bar at the bottom of the seven-segment display. To erase the display for the out-of-threshold count click the right mouse button on the title bar again.

Connecting to a Power Analyzer

2

3 Setting Up Power Quality Software

Introduction

Before a Power Analyzer can be used to monitor power quality, site-specific information must be defined for the instrument. The site name, trigger thresholds, sampling intervals, and memory allocation are all defined in this Site Setup operation. To access the Site Setup, click on the **Site** command box while in the PES Setup mode. Select the power quality mode by clicking on the Q mode button on the left-hand command bar.

Name Setup - Adding a New Power Analyzer to the Database

The Name Setup screen, shown in Figure 18, is the first screen to appear when you enter the PE Software Setup Site mode. This screen can also be accessed from other screens within Setup Site by clicking on the **Name** menu button. The Name Setup screen is used to define the name for a specific instrument at a given site, the type of instrument that is being used, the power type, country, system frequency, and voltage. If modems are being used to communicate with the instrument, the phone number and modem initialization information are specified here, also.

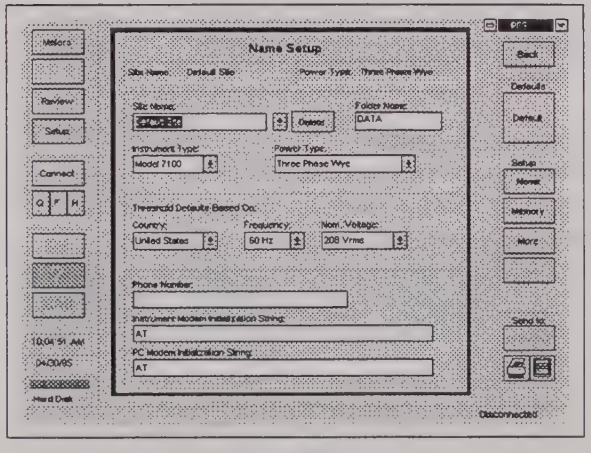

Figure 18: Name Setup Screen

To define a site name, use the mouse to click on the **Site Name** text box. Then type in a name up to 30 alpha-numeric characters in length. The PE Software automatically creates a file directory under the root directory **BMI_DATA** to store information collected by the instrument using this site name. The file directory name assigned by the PE Software appears in the **Folder Name** text box. The contents of this box cannot be edited by the user.

If you wish to select a site name that has already been defined, click on the down-scroll arrow next to the **Site Name** text box. A list box containing previously-defined site names appears in the window. Click on the site name you wish to use. The PE Software automatically closes the **Site Name** list box and displays the information for the selected site in the **Name Setup** text boxes. The threshold and memory selections are also restored to those previously defined for the site (see Chapter 4 for more information on the Threshold and Memory Setup options).

The **Instrument Type** box is used to select the type of instrument that will be used at the defined Site Name. This version of PE Software supports only the BMI Model 7100 power analyzer.

The **Power Type** text box contains a list of the power types that the instrument can be connected to. The power type selections available include none, single phase, split single phase, three phase wye, three phase delta, and crazy legged delta. Use the mouse to select the power type for the site in the **Site Name** text box.

The PE Software will automatically assign default settings based on the information specified in the **Power Type, Frequency,** and **Nom.** (nominal) Voltage text boxes. Use the mouse to select the country, frequency, and nominal voltage for the instrument in the **Site Name** text box.

If you are using modems to communicate with the instrument specified in the **Site Name** text box, type in the phone number for the instrument in the **Phone Number** text box. Modem initialization strings for the modem in the host computer and the instrument may be typed in to the **Instrument Modem Initialization String and PC Modem Initialization String** text boxes. These strings are used to initialize the modems every time communications is attempted with an instrument, allowing one PC modem to be used to communicate with different types of instrument modems. Refer to the user's guide for your modem to determine what initialization strings, if any, are required for communications using PE Software.

Setting Up Power Quality Software

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Threshold Setup

When the PE Software is in the Q mode, the **Threshold Setup** screen is used to define voltage thresholds for capturing RMS sags and swells, waveshape faults, and impulses. To access the **Threshold Setup** screen, use the mouse to click on the Threshold box from the **Setup Site** screen. The Threshold Setup screen will appear as shown in Figure 19.

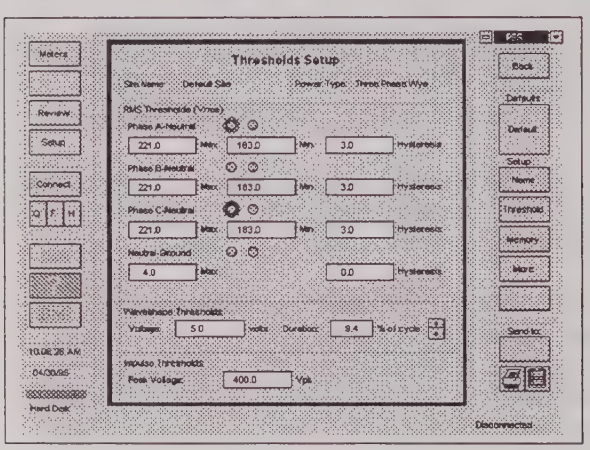

Figure 19: Theshold Setup Screen

RMS Thresholds

In order to be stored as a disturbance, RMS variations must exceed a high or a low threshold for a period that exceeds the **Cycles** to trigger value specified in the Memory Setup screen. The Memory Setup screen is discussed more in this Chapter.

The first RMS threshold box, located in the upper left-hand corner of the **Threshold Setup** screen, is highlighted when you first enter the screen. Use the keyboard to type in a new value for the Vrms Max. (RMS swell threshold) for this channel, or click the **Default** command button.

A factory-set default for the power type and nominal voltage that was selected in the **Name Setup** screen will be inserted for the value.

Press the **TAB** key on your keyboard or use your mouse to select the next text box, the Vrms Min. (RMS sag threshold) box. Again enter the value to be used or click on the Default command button.

Next, select the **Vrms Hysteresis** text box. This value is used in conjunction with the RMS threshold value to define the end of an RMS disturbance. The RMS value must remain greater than **Vrms Hysteresis** away from the threshold for a minimum of **Cycles to end**, which is specified in the **Memory Setup** screen, described later in this chapter.

Figure 20 illustrates the RMS disturbance thresholds for a voltage sag.

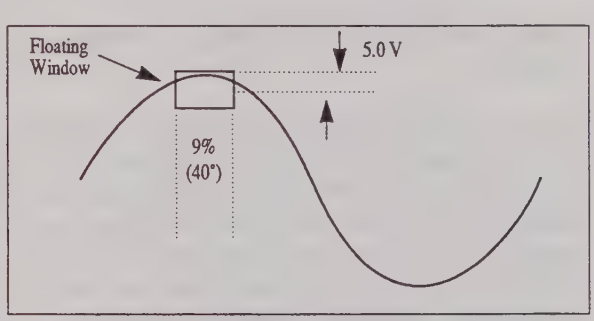

Figure 20: RMS Voltage Sag

Continue specifying the Vrms Max., Vrms Min., and Vrms Hysteresis values for all channels in the display. The number of channels is determined by the Power Type text box in the Name Setup screen.

Waveshape Thresholds

BMI instruments use a patented digital technique* to detect changes in the shape of the voltage waveforms. Essentially, this technique compares the samples from each cycle to the corresponding samples from the previous cycle. If the voltage samples' values differ by more than a defined amount for a length of time exceeding a defined percentage of the cycle, a waveshape fault is recorded.

To define the thresholds for a waveshape fault, enter the voltage and % of cycle in the corresponding text boxes in the Waveshape Thresholds section of the Thresholds Setup screen. The Default command button can be used to insert BMI-supplied default values.

*This technique is fully described in the technical paper "A Floating-Window Algorithm for Detecting Certain Power Faults that Disrupt Sensitive Electronic Loads", available from BMI.

Figure 21 shows a voltage cycle and the corresponding waveshape thresholds for 5 volts and 9 %.

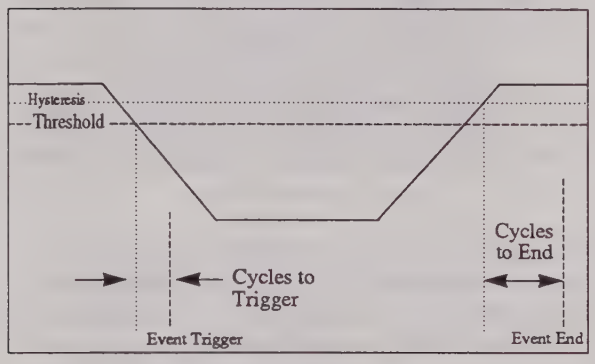

Figure 21: Waveshape Fault Thresholds

Impulse Thresholds

Impulses are detected between the frequencies of 5 KHz and 1 MHz. The low frequency limit prevents slower voltage fluctuations, which are captured by either the RMS or Waveshape Fault triggers, from also being recorded as an impulse. The lower frequency signal is filtered out of the waveform prior to impulse detection. Accordingly, the impulse threshold is specified in absolute volts without taking into account the voltage level of the signal it is riding on. To set the impulse threshold, specify the voltage value in the **Peak Voltage** text box of the **Impulse Thresholds** section of the **Threshold Setup** screen.

Memory Setup

The memory storage available for any power monitor has some finite limit; if too many events occur, if thresholds aren't set properly, or if data isn't removed from the instrument's memory often enough, the memory will eventually fill up. This is potentially a serious problem; if memory is full, additional events can't be recorded and important information can be missed.

The PE Software alleviates this problem by allowing memory to be allocated to each event type. If, for example, a lightning storm moves through the area where a power monitor is recording data, the memory allocated to impulse disturbances may fill up quickly. By not allowing impulses to use more than a predetermined amount of instrument memory, additional RMS or waveshape disturbances that occur as a result of the storm or after the storm will still be recorded.

In addition to disturbance events, steady-state data such as RMS voltage and current over time and waveform snapshots can be recorded. By varying the sampling rate, sampling size, and recording rate, memory can be allocated in such a way to insure that steady-state data is always recorded.

If you choose to use an instrument exclusively as a steady-state recorder, you may not wish to even collect disturbance data. Likewise, you may wish to only record potentially disruptive power problems to correlate with equipment malfunctions. In either case, the **PE Software Memory Setup** screen can be used to program the instrument to record only the data you're interested in, and only the amount of data you wish to collect.

To specify the steady-state setups, memory allocation among event types, and the amount of data recorded with each event, select the Memory button with the mouse. The Memory Setup screen will appear as shown in Figure 22.

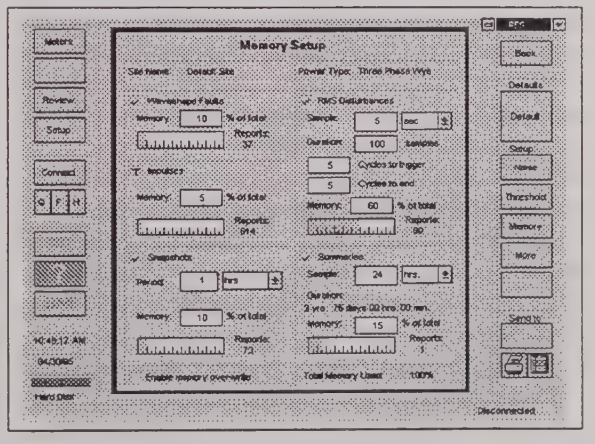

Figure 22: Memory Setup Screen

The Memory Setup screen contains five event control boxes, one each for Waveshape Faults, RMS Disturbances, Impulses, Snapshots, and Summaries.

Enabling and Disabling Event Recording

The recording of each event type can be individually enabled or disabled entirely. To enable the recording of an event type, click on the control box next to the event type name. If a "∏" or a "T" appears in the box, then events of this type will be recorded by the instrument after the setups are sent to the instrument. If the box is empty, the instrument will be instructed to ignore all events of this type.

In addition to enabling and disabling the recording of events, you may optionally choose to record only text data for impulse and RMS events. If a "T" appears in the control box next to Impulses and RMS Disturbances, waveshape data will not be saved, making more memory available for the recording of additional impulses, RMS disturbances, or available to other event types. A "∏" in the control box means that waveshape data will be recorded for the event.

Memory Allocation

Instrument memory can be allocated to each event type by typing the per cent of total memory to be allocated for each event type in the **Memory: % of total** text box of each event control box. The mouse or the **Tab** key can be used to move between boxes. The number entered into each text box can be between 0 and 100. The bar graph display below the text box will reflect the value entered graphically by automatically changing the length of the bar. For convenience, the total memory used for all events is tallied and displayed at the bottom of the **Memory Setup** screen. This total must equal 100% or less before you exit the Memory Setup screen. Also for convenience, the total number of events of each type that can be recorded based on the memory allocation for that event is displayed in the lower right-hand corner of the event display box.

The amount of memory allocated to each event type can alternatively be modified by clicking and holding on the right-most edge of the bar in the bar graph display, then dragging the bar to the desired percentage. The **Memory: % of total** text box will automatically display the value as it is changed this way.

If the total memory allocated is more than 100%, the PE Software will automatically display a **Setup Error** dialog box, shown in Figure 23, when you try to exit the **Memory Setup** screen or send the setups to the instrument

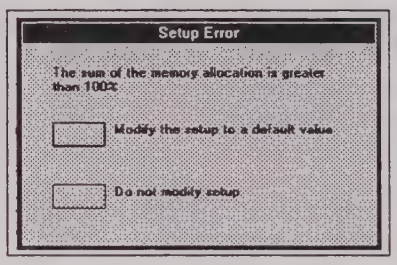

Figure 23: Setup Error Dialog Box

The Setup Error dialog box states that the memory allocation is greater than 100%, and allows you correct the problem in one of two ways. By selecting the **Modify the setup to a default value** command box, the PE Software will automatically adjust the values for all memory allocation text boxes to default values that total 100%.

The **Do not modify setup** command button will close the **Setup Error** dialog box and return to the **Memory Setup** screen. The individual allocations can then be modified until the total equals 100%.

BMI monitoring instruments will collect data until the memory allocated for each event type becomes full. If the Enable memory overwrite control box is not selected, then recording for each event type will stop when the allocated memory is used up. If a "∏" appears in the control box, then event recording will continue, overwriting the existing data on a first-in, first-out basis.

Snapshot Period

When recording a snapshot, the instrument will collect one cycle of waveform data for each channel. To specify how often snapshots are recorded, you must enter the amount of time between snapshots in the **Period** text boxes.

For example, if the period is set to 30 minutes, then 48 snapshots will be collected every 24 hours until the memory allocated to snapshots is filled up.

RMS Disturbances

RMS values used to trigger events can be calculated over any length of time. For some applications, you may wish to calculate the value of the RMS voltage every cycle. This is appropriate when the load being monitored is sensitive to single-cycle fluctuations in RMS voltage. On the other hand, loads may be insensitive to RMS fluctuations of less than several cycles, and then RMS values would be more appropriately calculated over several cycles.

The PE Software can be used to set the number of cycles over which RMS values are calculated. This is done to match the instrument sensitivity to the load sensitivity, thus minimizing the amount of data that is collected by triggering RMS events only when they might affect a particular load.

To set the time period over which RMS calculations will be made, enter the number of cycles or seconds in the **Sample:** text box. The values entered can be between 1 and 299 cycles, or between 1 and 5 seconds.

The maximum length of time that an RMS disturbance will be recorded is determined by the **Duration** text box. This time is specified by entering the maximum number of samples that will be recorded, where the sample time was determined with the entry in the **Sample:** text box. By multiplying the duration in samples times the sample time in cycles or seconds, the overall maximum RMS event time can be determined. The maximum number of samples that can be used in the **Duration** text box is 512.

Thus, the maximum RMS event time that can be recorded for a single event is:

512 x 5 secs. = 2560 secs. = 44 minutes

Note that the resolution of the RMS data, determined by the Sample: text box, is directly proportional to the maximum duration of an RMS event. You can record very long RMS events by reducing the resolution. Or, you can record high resolution RMS events by reducing the maximum recording time.

The value in the **Cycles to trigger** text box determines how many cycles the RMS voltage of any channel must be outside of the threshold before an event is triggered and recording begins. This value can be specified to be from 1 to 255 cycles. If a number greater than 255 is specified, the PE Software will automatically set the value at 255.

The value in the **Cycles to end** text box determines how long all channels must be within the thresholds before the event is considered over and the recording of the event ends. This value can be specified to be from 1 to 9999 cycles.

The minimum RMS event time is determined by the **Cycles to trigger** and **Cycles to end** text boxes.

Summaries

The value of RMS voltage and current for all channels are calculated every cycle for creating summary reports. The minimum and maximum RMS values are then determined and recorded for a time period equal to the value entered in the **Sample:** text box. The values entered into the **Sample:** text box can be from 1 to 1440 minutes, 1 to 24 hours, or 1 day. All entries made in days are converted to hours in the display when you leave the **Memory Setup** screen and return.

The minimum and maximum values for all channels are continuously recorded until the memory allocated for Summaries is full. The total maximum duration of the summary report is calculated by the PE Software based on the **Sample:** and **Memory: % of total** text box entries. The duration time is displayed in the middle of the **Summaries** event control box.

Setting Potential Transformer and Current Transformer Ratios

When using BMI power monitors with BMI-supplied clamp-on current probes and connecting directly to 600 Vrms or less, all reports and graphics are labeled with the actual current and voltage levels. When making indirect measurements using potential transformers (PTs) and non-BMI-supplied current transformers (CTs), the scaling factor due to the PT and CT must be accounted for in order to produce reports and graphs with the correct scales.

Setting Up Power Quality Software

To define these PT and CT ratios, click on the **More** command box while in the Site Setup monitor. The PT and CT setup page shown in Figure 24 will be displayed. Note that while PT ratios for line voltage or CT ratios for line current must be the same, while the PT ratio for neutral voltage and the CT ratio for neutral current can be different. This accommodates different sized PTs and CTs to be used on the neutral for more accurate measurements on these values, which are typically much lower than line voltage and current values.

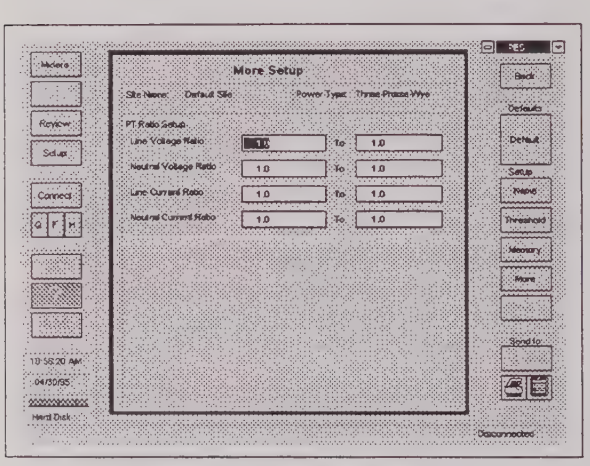

Figure 24: PT and CT Setup Screen

To set the PT and CT ratios, click on the left-hand box for the appropriate PT or CT. Then use the keyboard to input the primary ratio. Click on the right-hand box or press the Tab key, then use the keyboard to enter the secondary ratio. The default values are always 1 to 1, which is the correct setting for BMI-supplied CTs and direct voltage connections.

Setting the Power Analyzer Clock

While communications is enabled with an instrument using the **Connect** function, the clock in the monitoring instrument can be set using the **Time** command while in the Setup Site screen. Click on the **Time** command button to view the Instrument Time Setup screen, shown in Figure 25.

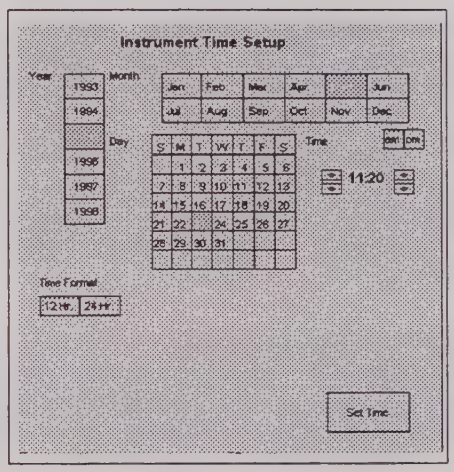

Figure 25: Instrument Time Setup

Upon entering the screen, the current time and date of the PC is displayed. If this is correct, click on the Set Time command button with the mouse to set the time in the instrument to match.

If the time displayed is not correct, use the mouse to select 12 or 24 hour time format, year, month, and day. Use the up/down arrows to set the time, and select AM or PM if using a 12 hour time format. Then click on the Set Time command button to set the time in the instrument. See Chapter 1. for more details on setting the date and time in the Instrument Time Setup screen.

Using Built-in Defaults

When using the PE Software for the first time, it may be helpful to use BMI defaults or to refer to them to help develop a sense of appropriate values for the many programmable functions of the power monitoring instrument.

To access these built-in default values, simply click on the **Default** command button at any point in the **Setup Site** menus. Default values for most of the individual text boxes are available through this command button and can be used as is or modified to reflect specific circumstances at the site to be monitored.

Sending the Setup Data to the Power Analyzer

After all of the site setup parameters have been defined, they can be sent to the instrument. Simply click on the **Send to Instrument** command button to upload the setup data to the instrument that is connected to the host PC via RS-232 or modem. See Chapter 2 for more information on connecting to a power analyzer.

Sending the Setup Data to the Printer

The print command box, represented by the printer icon in the lower right-hand corner of the display, can be used to print the site setup data for each site. The setup file will automatically be printed to the printer selected in the Windows control panel.

Sending the Setup Data to the Windows® Clipboard

To export the site setup data to another Windows application as a text file, click on the export command box, represented by the clipboard icon in the lower right-hand corner of the display. The text file will be copied into the Windows Clipboard, and from there can be pasted into other applications.

Setting Up Power Quality Software

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4

Retrieving and Reviewing Power Quality Data

Introduction

Instruments that are controlled by the PE Software monitor power and save disturbance events and steady-state data independently. The data is maintained locally in each instrument until it is retrieved by the PE Software using an RS-232 or modem communications link.

The Data Transfer Function

To manually transfer data from an instrument into the PE Software, first establish a communications link between the instrument and the PC using the Connect function, described in Chapter 2.

After establishing a communications link, click on the **Review** mode command button to enter the data review screen. You must be in the **Review** screen to transfer data. The **Review** screen is shown in Figure 26.

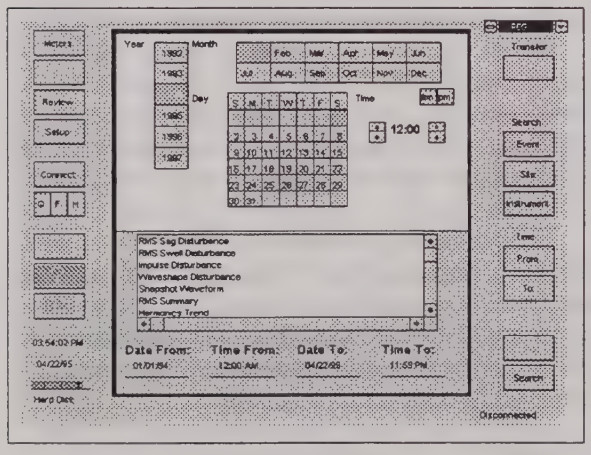

Figure 26: Review Screen

When the PE Software has established communications with an instrument using the **Connect** function, the **Transfer** function in the upper right-hand corner of the **Review** screen is enabled. Click on the **Transfer Start** command button to begin the data transfer from the instrument to the PE Software. The Communications Status Bar in the lower right-hand corner of the screen will indicate "**Transferring**" after the **Start** command is activated.

After the transfer has begun, the **Start** command button changes to **Stop**. To abort the transfer of data, click on the **Stop** command button.

Automatic Data Transfer

Setting Up the Auto-Download Schedule

The PE Software can be setup to automatically schedule instrument data transfers. To access the Auto-Download Schedule Setup, click on the Download button from the Right Toolbar while in the PE Software Setup mode. The Auto Download Setup screen is shown in Figure 27.

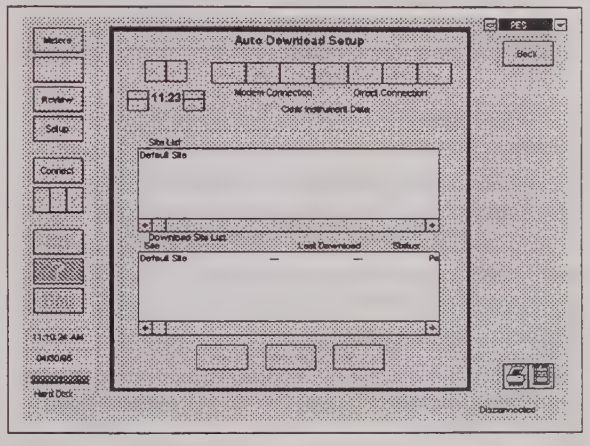

Figure 27: Auto Download Setup

The Auto-Download Schedule screen is broken into 3 sections. The top section of the screen contains controls for setting up a Site to auto-download, the middle section of screen contains a list box that contains the Site Names that have been entered with the PE Software, and the bottom section of the screen contains a list box containing the Site Names that are in the auto-download schedule and controls to add, remove, and reset a desired auto-download site(s).

To add a Site Name to the auto-download schedule select one or more Site Names from the PE Software site name list and select the **Add** button from the bottom section of the screen. Any Site Names that are not already in the auto-download schedule are added to the auto-download site list box in the bottom section of the screen.

Retrieving and Reviewing Power Quality Data

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To setup a Site Name(s) from the auto-download site list box, select the desired Site Name(s) by using the mouse. The current schedule setup will be reflected in the schedule setup controls in the top section of the screen.

The schedule setup controls include: time of day to download (only one scheduled download time can be specified), the days of the week to download, a check box to enable the clearing of the instrument data, and toggle check boxes to indicate the type of connection to make when downloading (RS-232 or modem). The same schedule setup can be entered for more than one Site Name. The PE Software will insure that any transfers that cannot be started when scheduled due to another transfer in progress will be marked as pending. The transfer will then begin at the next available time that a connection can be made.

If the **Clear Instrument Data** check box is selected, data in the instrument will be deleted after it is downloaded into the host computer. If the box is cleared, then data can be download from an instrument without deleting the data in the instrument. This feature is useful in allowing one user to control and manage the database from one or more instruments, while allowing many users access to the data from multiple sites before it is downloaded into the database.

A Site Name(s) download schedule is entered by performing the following steps:

1) Enter the scheduled download time using the hour and minute scroll bars and the **AM/PM** buttons in the digital clock.

2) Enter the scheduled download days of the week by pressing the day of the week buttons. A day of the week button that is pressed indicates a day of the week that the instrument data will be transferred.

3) Select the connection type for the instrument, either direct connection or modem connection, from the connection type check boxes.

4) Select whether to clear the instrument data when the instrument data is transferred. A proper password must be entered to clear the instrument data.

The PE Software will create a log for each site in the auto-download list. The auto-download log contains a historical record of each auto-download that was scheduled. For each scheduled download the transfer status, transfer start time, transfer complete time, the total pass transfer count, the total error transfer count, and the schedule setup will be recorded in the auto-download log.

To remove a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Remove** button from the bottom section of the screen. This will remove the selected Site Name(s) from the auto-download schedule and delete the auto-download log for the site(s).

To reset a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Reset** button from the bottom section of the screen. This will delete the auto-download log for the site.

The auto-download **Site List** box also displays the last download that was scheduled and whether it passed or failed for each of the sites in the list box.

To print or copy the auto-download schedule and a log of the previous downloads as a text report, select the desired Site Name(s) from the download **Site List** (selecting none will print or copy all the logs) and click on the **Print** or **Copy** buttons from the right toolbar.

When the auto-download schedule setup screen is displayed no transfers will be started. While an auto-download scheduled transfer is in process, the **Connect** button on the left toolbar is disabled. The current status of the auto-download schedule is displayed in the Communications Status Bar.

Reviewing Data From a Power Analyzer

To view events that have been collected from a analyzer(s), click on the Review mode button. The Review screen will appear as shown in Figure 28.

4

Retrieving and Reviewing Power Quality Data

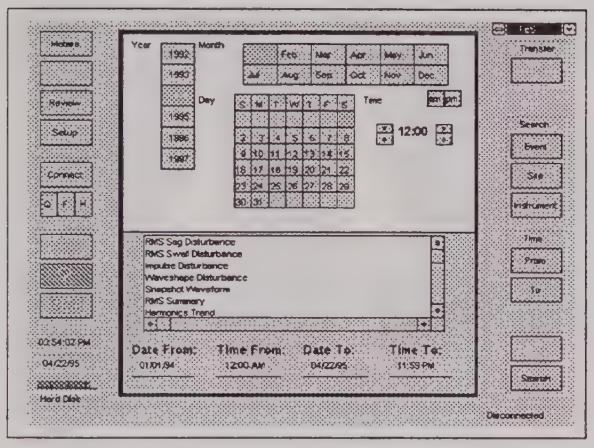

Figure 28: Review Data Screen

Review Mode Search Criteria

The Review mode allows you to search for and view events by event type, by site name, and by instrument type for any time window. This advanced capability makes it practical for a single PE Software user to collect, sort, evaluate, analyze, and report on events using multiple instruments.

Creating a Search Time Window

The **From** and To Time command boxes are used in conjunction with the calendar and clock display to set a time window for the events you wish to view. For example, a piece of electronic equipment on the feeder that is monitored by a power analyzer may have inexplicably shut down on a particular day at a particular time. By reviewing all events that happened within an hour of the equipment malfunction, power quality can be attributed or dismissed as the source of the problem.

To set up the time window, the beginning date and time and the ending date and time of the window must be specified. Select the **From** command button to specify the beginning of the time window. The **Date From:** and **Time From:** display at the bottom of the Review screen indicate the start date and time for the window. Use the mouse to change the start date by clicking on the year, month, and day calendars. Specify the start time by using the up/down arrows and the **AM/PM** buttons in the time display. Next, select the To command button, then repeat the calendar and time selection process for the end of the date and time window.

All events that are viewed will be events that occurred during the date and time window specified using these criteria. As PC and instrument clocks may drift significantly from each other if they aren't set periodically, its a good idea to allow a margin of time around the desired time window when specifying the search time criteria.

Searching by Event Type, Site Name, and Instrument Type

After you have determined the search time window, you may wish to focus on one or more event types for your search criteria.

Any individual event type can be singled out for review. Alternatively, all event types can be included in the event search criteria. Additionally, any number of event types that include the event types prior to it in the display list can be reviewed.

To choose the event(s) that you wish to include in the search criteria, click on the **Event** command button under the **Search** area of **Review** on the right-hand side of the screen. The dialog box in the center of the screen will list all of the disturbance types available, as shown in Figure 29.

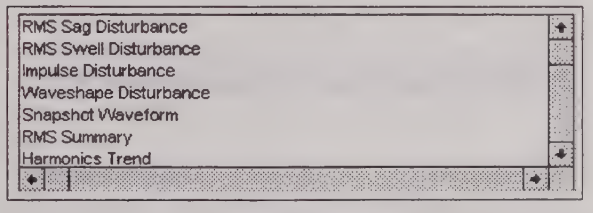

Figure 29: Event List

Click on the event type that you wish to include in the search. Select all of the event types by clicking and holding on the first one, then dragging down to the bottom of the list.
The selected event(s) will be highlighted and included in the search.

Retrieving and Reviewing Power Quality Data

As with event types, site names can also be selected to include in the search criteria. Click on the **Site** command button in the Review screen to produce the site list command box, as shown in Figure 30.

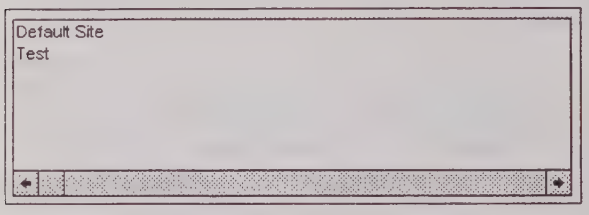

Figure 30: Site List

Use the same procedures described in the previous paragraphs to select one or more site names from the list to include in the search criteria.

Finally, the instrument type to be included in the search criteria would be selected. However, as this version of PE Software supports only the BMI Model 7100, the instrument site is always selected. Click on the Instrument command button to view the instrument list, as shown in Figure 31.

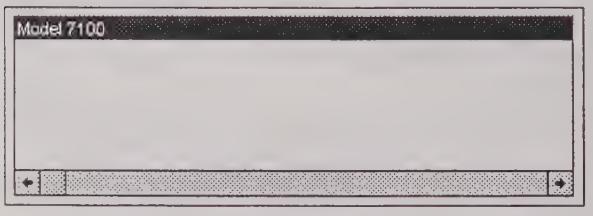

Figure 31: Instrument List

Performing the Search

After the search time window, event type, site name, and instrument type search criteria have been specified, start the search by clicking on the **Search** command box. The event summary display will appear in the screen as shown in Figure 32.

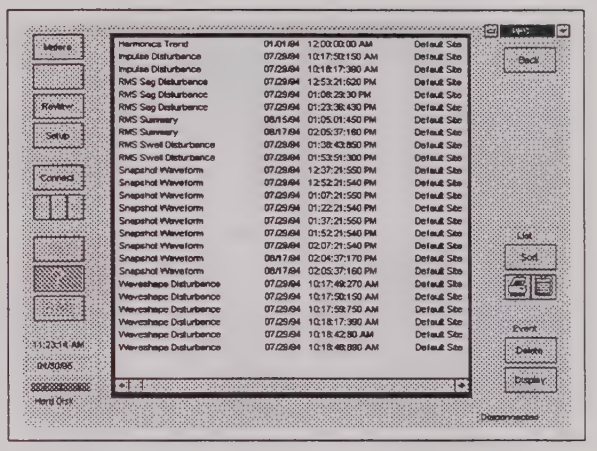
Harmonics Trend 01.01.94 12:00:00:00 AM Default Site
Impulse Disturbance 07/29/94 10:17:59:150 AM Default Site
Impulse Disturbance 07/29/94 10:18:17:360 AM Default Site
RMS Sag Disturbance 07/29/94 12:53:21:620 PM Default Site
RMS Sag Disturbance 07/29/94 01:08:28:30 PM Default Site
RMS Sag Disturbance 07/29/94 01:23:38:430 PM Default Site
RMS Summary 08/15/94 01:05:01:450 PM Default Site
RMS Summary 08/17/94 02:05:37:160 PM Default Site
RMS Swell Disturbance 07/29/94 01:38:43:850 PM Default Site
RMS Swell Disturbance 07/29/94 01:53:51:300 PM Default Site
Snapshot Waveform 07/29/94 12:37:21:550 PM Default Site
Snapshot Waveform 07/29/94 12:52:21:540 PM Default Site
Snapshot Waveform 07/29/94 01:07:21:550 PM Default Site
Snapshot Waveform 07/29/94 01:22:21:540 PM Default Site
Snapshot Waveform 07/29/94 01:37:21:550 PM Default Site
Snapshot Waveform 07/29/94 01:52:21:540 PM Default Site
Snapshot Waveform 07/29/94 02:07:21:540 PM Default Site
Snapshot Waveform 08/17/94 02:04:37:170 PM Default Site
Snapshot Waveform 08/17/94 02:05:37:160 PM Default Site
Waveshape Disturbance 07/29/94 10:17:49:270 AM Default Site
Waveshape Disturbance 07/29/94 10:17:59:150 AM Default Site
Waveshape Disturbance 07/29/94 10:17:59:750 AM Default Site
Waveshape Disturbance 07/29/94 10:18:17:390 AM Default Site
Waveshape Disturbance 07/29/94 10:18:42:80 AM Default Site
Waveshape Disturbance 07/29/94 10:18:48:880 AM Default Site
Restore
Review
Setup
Connect
Back
Sort
Delete
Display
Disconnected
Hard Disk

Figure 32: Event Summary

Deleting Events

Events that are not needed can be deleted from the PE Software database to free up disk space for other uses. To delete events, click on an event or click and drag on a group of events in the event summary list. The events that are selected will be highlighted. Click on the **Delete** command button to delete the highlighted event(s).

Sorting Events

The event summary lists all events that match the search criteria, sorted by site name, date, time, and event type. The order in which the events are listed can be changed to any desired order.

To change the sorting order, click on the **Sort** command button. The **Sort Event List** dialog box will be displayed as shown in Figure 33.

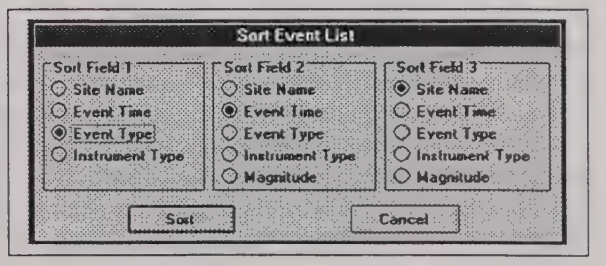

Figure 33: Sort Event List Dialog Box

4

Retrieving and Reviewing Power Quality Data

Click on the radio button next to the **Site Name, Event Time, Event Type,** or **Instrument Type** in **Sort Field 1** to select the primary sorting preference. Select a radio button next to the desired sort criteria in **Sort Field 2** to set the secondary sorting preference and in **Sort Field 3** to set the tertiary sorting preference.

After the sorting preferences have been set, click on the **Sort** command button. The PE Software will resort and re-display the event summary. Click on the **Cancel** command button at any time to abort the sort and return to the **Review** screen.

Displaying Events

To view the events, click or click and drag on an event or group of events in the event summary list to highlight the events you wish to see. Then click on the **Display** command button. The event (or first event in the group) will be displayed as shown in Figure 34.

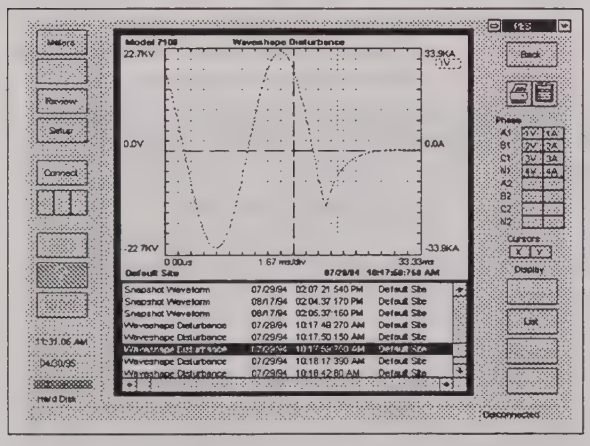

Figure 34: Event Display

The elements of the event display are shown in Figure 35.

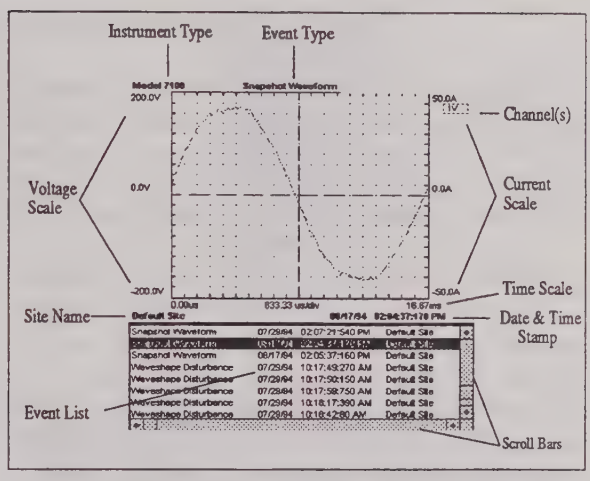

Figure 35: Elements of the Event Display

Switching Between Events

To view different events while in the event display, double-click on the event you wish to see in the event list. That event will then appear in the display window.

If the event you wish to view is not in the display window, click on the Back command button. The original event summary will be displayed. Highlight the event(s) you wish to review, then click on the **Display** button to reenter the event display.

Selection of Phases

When the event is initially displayed in the event display, the voltage channel which first triggered will be the channel displayed. It may often be desirable to view all voltage channels, all current channels, or the voltage and current from a single channel simultaneously.

Additional channels can be added to the display or removed from the display by clicking on the channel buttons in the middle of the right side of the display. The channel buttons are shown in Figure 36. As each channel is added to the display, the color key for that channel appears in the upper right-hand corner of the display.

Retrieving and Reviewing Power Quality Data

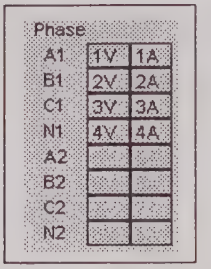

Figure 36: Channel Buttons

Using the Cursors to Measure Events

To measure the voltage, current, or time events in the event display accurately, the PE Software supports X- and Y-axis cursors, similar to modern digitizing oscilloscope displays. These cursors can be positioned with the mouse and the corresponding differential values read in the bottom of the display.

To use the X- and Y-axis cursors, click on the **X** and **Y** Cursor command boxes. The cursors will appear in the display and the event list in the bottom of the display will be replaced by the cursor information, as shown in Figure 37.

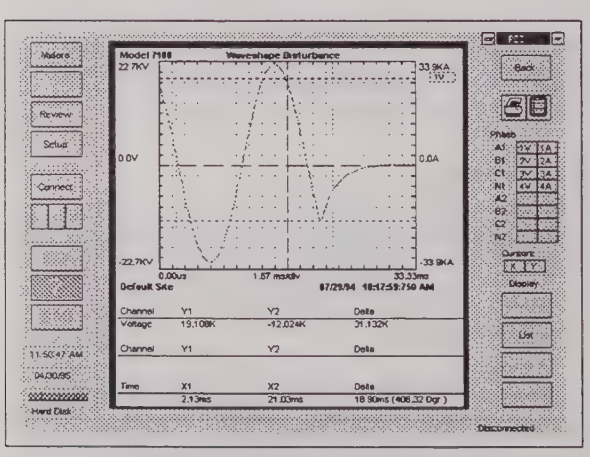

Figure 37: X- and Y-axis Cursors

To move the cursors, click and hold each cursor with the mouse while dragging it to the desired location in the display.

Zooming Display Events

Since the PC display has a resolution that may be far less then the resolution at which the instrument samples the event data, the PE Software provides a zooming function to display the event data in greater detail.

There are no command boxes needed to perform this function. To zoom in on a portion of the event display, the left mouse button is used to create and define a zooming region. This is similar to zooming procedures found in PC drawing or CAD software packages.

To zoom in on the event display, place the mouse cursor at the upper left corner of the region of the event to be zoomed. Hold down and drag the left mouse button. A dotted rectangle defining the zoom region will be displayed, with the cursor changing to a magnifying glass containing a '+' in it. Release the left mouse button when the desired zoom region has been established. A minimum zoom region of 20 by 20 display pixels is allowed by the PE Software.

If an invalid zoom region is selected, an error beep will sound. Once zoomed, the event display will be redrawn with new voltage, current, and time scales. Once the event display has been zoomed, the cursor will be displayed as a magnifying glass containing a '-' in it to remind you that the event display is not full scale. Zooming can be performed multiple times.

To unzoom the event display, click the right mouse button anywhere in the display.

Harmonics Analysis

The PE Software can perform harmonics analysis on the Snapshot Waveforms captured using the power quality mode of operation. These harmonic calculations are performed in Review Mode after the data is downloaded from the instruments into the PE Software database. The PE Software displays:

- Waveforms for each phase of voltage and current
- Lists the odd harmonic content for each waveform in both IEEE and IEC formats
- Displays the harmonic spectrum chart for each waveform
- Builds individual site trends of harmonic activity over any time period you specify

4 Retrieving and Reviewing Power Quality Data

Displaying Individual Snapshots and Harmonics Text Reports

To display individual snapshots, click on the **Review** mode command button on the left-hand side of the PE Software display. Select the Snapshot Waveform while in the **Event** mode, then select the appropriate **Site, Instrument**, and **From** and **To** times. Then click on the **Search** command box. A list of all snapshots in the database for the criteria selected will appear in the screen.

Select one or more snapshots in the list by highlighting them with the mouse, then click on the **Display** command. Select the voltage or current channel of interest using the **Phase** boxes.

Click on the **Measured** command box to see the odd harmonics, THD, and odd and even harmonic totals in the lower part of the display. To change the harmonics display from % of fundamental (IEEE-style) to % of RMS (IEC-style), position the mouse cursor on a blank part of the display outside of the graph area. The Harmonics Display Options dialog box will appear on the screen as shown in Figure 38.

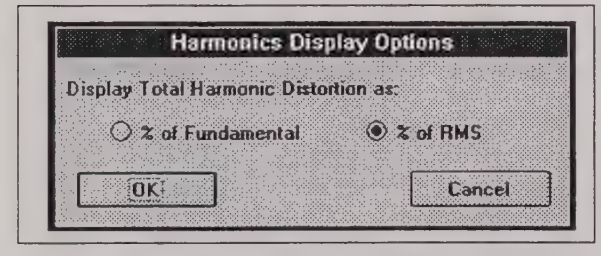

Figure 38: Harmonics Display Options

Click on the radio button corresponding to the IEEE- or IEC-style of harmonic calculations. If you select % of Fundamental, the Distortion listing in the Measured harmonics display will appear with the title "THD". If you select % of RMS, the Distortion listing will appear as "thd".

If you wish to see a harmonics spectrum graph, click on the Harmonics command box. The text listing of the odd harmonics will be replaced with a graph of the harmonic spectrum.

Building Harmonics Trend Data

A harmonics trend graph presents all of the harmonics snapshots collected over a specified period of time on one graph. To build a trend, build a search time window for the trend as described in section 4.8.1. (only Snapshot Waveform can be selected in the Event window in order to build a harmonic trend). Then click the Trend command box instead of the Search command box. A harmonics trend will be built, then listed in the file menu. Select the trend file using the mouse, then click on the **Display** command box.

While viewing a harmonics trend, all of the display options discussed earlier are available, including zoom and phase selection. You can also choose to display odd or even harmonics, THD, or individual harmonics in IEEE or IEC formats. To choose the display type, click on any blank area of the Harmonics Trend Graph. The Snapshot Trends Display Options will appear in the screen, as shown in Figure 39.

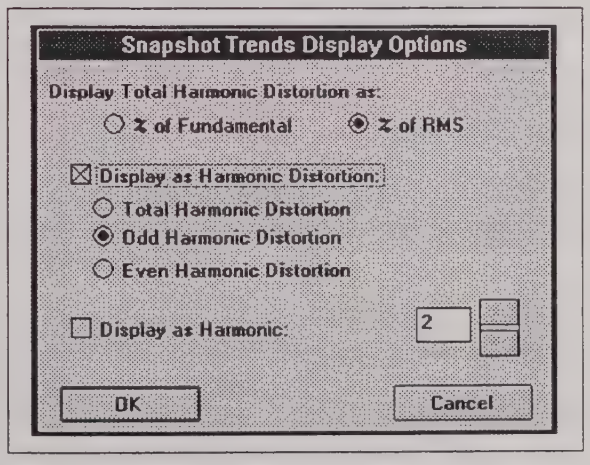

Figure 39: Snapshot Trends Display Options

Retrieving and Reviewing Power Quality Data

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5 Setting Up Power Flow Software

Introduction

Before Power Flow software can be used to monitor power, site-specific information must be defined for the instrument. The site name, demand and summary intervals, and memory allocation are all defined in this Site Setup operation. To access the Site Setup, click on the **Site** command box while in the PES Setup mode. Select the power flow mode by clicking on the **F** mode button on the left-hand command bar.

Name Setup - Adding a New Power Flow Monitor to the Database

The Name Setup screen, shown in Figure 40, is the first screen to appear when you enter the PE Software Setup Site mode. This screen can also be accessed from other screens within Setup Site by clicking on the **Name** menu button. The Name Setup screen is used to define the name for a specific instrument at a given site, the type of instrument that is being used, the power type, country, system frequency, and voltage. If modems are being used to communicate with the instrument, the phone number and modem initialization information are specified here, also.

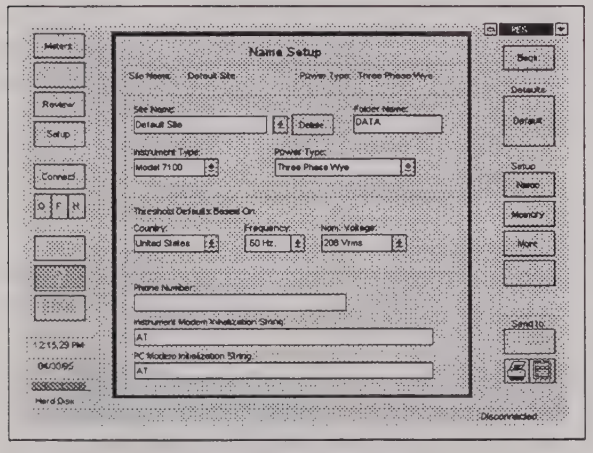

Figure 40: Name Setup Screen

To define a site name, use the mouse to click on the **Site Name** text box. Then type in a name up to 30 alpha-numeric characters in length. The PE Software automatically creates a file directory under the root directory BMI_DATA to store information collected by the instrument using this site name. The file directory name assigned by the PE Software appears in the **Folder Name** text box. The contents of this box cannot be edited by the user.

If you wish to select a site name that has already been defined, click on the down-scroll arrow next to the **Site Name** text box. A list box containing previously-defined site names appears in the window. Click on the site name you wish to use. The PE Software automatically closes the **Site Name** list box and displays the information for the selected site in the **Name Setup** text boxes. The memory selections are also restored to those previously defined for the site.

The **Instrument Type** box is used to select the type of instrument that will be used at the defined Site Name. This version of PE Software supports only the BMI Model 7100 power analyzer.

The **Power Type** text box contains a list of the power types that the instrument can be connected to. The power type selections available include none, single phase, split single phase, three phase wye, three phase delta, and crazy legged delta. Use the mouse to select the power type for the site in the **Site Name** text box.

The PE Software will automatically assign default settings based on the information specified in the **Power Type, Frequency**, and **Nom.** (nominal) **Voltage** text boxes. Use the mouse to select the country, frequency, and nominal voltage for the instrument in the **Site Name** text box.

If you are using modems to communicate with the instrument specified in the **Site Name** text box, type in the phone number for the instrument in the **Phone Number** text box. Modem initialization strings for the modem in the host computer and the instrument may be typed in to the **Instrument Modem Initialization String** and **PC Modem Initialization String** text boxes. These strings are used to initialize the modems every time communications is attempted with an instrument, allowing one PC modem to be used to communicate with different types of instrument modems. Refer to the user's guide for your modem to determine what initialization strings, if any, are required for communications using PE Software.

Setting Up Power Flow Software

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Power Flow Demand Report Setup

When the PE Software is in the F mode, the Memory Setup screen is used to define Demand and Summary intervals as well as to allocate instrument memory for storing this data. To access the Memory Setup screen, use the mouse to click on the Memory box while in the Site Setup screen. The Memory Setup screen will appear as shown in Figure 41.

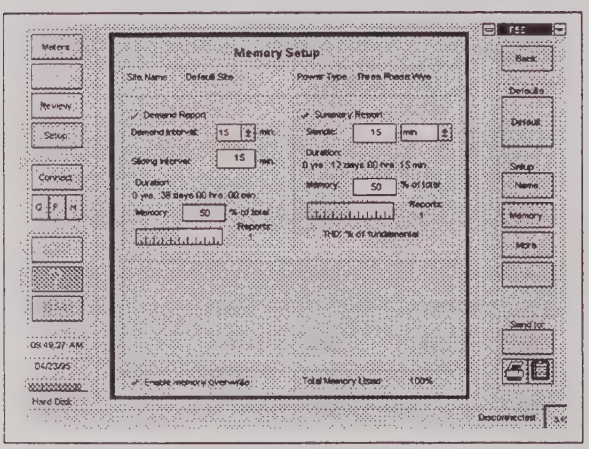

Figure 41: Power Flow Memory Setup

To record demand reports, click on the **Demand** command box until a "∏" appears in the box. If the command box is empty, demand reporting will be disabled.

To setup up the instrument for a Demand Report the Demand Interval is selected from the available intervals in the drop down listbox. Valid Demand Intervals are 1, 2, 3, 4, 5, 10, 12, 15, 20, 30, or 60 minutes. These predetermined Demand Intervals force the sampled instrument data onto even minute increments of an hour boundary for watt-hour calculations.

Next, the desired Sliding Interval is specified. Valid Sliding Intervals are from 1 to 60 minutes. Setting the Sliding Interval equal to the Demand Interval forces the PE Software to use a Fixed Demand Interval.

The available instrument memory can be allocated to demand and summary recording using the Memory text box.

Note: Other Demand and Sliding Intervals can be specified when the Demand Reports are displayed in Review Mode of the PE Software.

The value of watt-hours (WH) and volt-amp-hours (VAH) for all channels are calculated every cycle for creating Power Flow Demand Reports. The average values are then determined and recorded for a time period equal to the Sample Interval. The Sample Interval is calculated by the PE Software from the specified Demand Interval and Sliding Interval. For example, if the Demand Interval is specified as 15 minutes and a Sliding Interval is specified as 12 minutes, the Sample Interval will be set at 3 minutes (the highest Sample Interval that satisfies the Sliding Interval and is also evenly divisible to the Demand Interval).

The total Demand Report duration is calculated based on the Sample Interval and the amount of memory allocated to Demand Reports. The total Demand Report duration is displayed on the PE Software screen and is recalculated whenever the memory allocation is changed or the Demand and Sliding Interval is changed. The total duration is displayed as the MAX duration. The Demand Report, if desired, can be transferred from the instrument before the duration has expired.

The average values for all channels are continuously recorded until the memory allocated for Demand Reports is full (unless **Enable memory overwrite** is on for the instrument).

Power Flow Summary Report Setup

To record power flow summaries, click on the Summaries command box until a "∏" appears in the box. If the command box is empty, summary recording will be disabled.

The value of Watts, Volt-Amps, RMS Voltage and Current, Power Factor, Displacement Power Factor, Total Harmonic Distortion for both Voltage and Current, and Volt-Amps Reactive is calculated for all channels once per cycle to create the Power Flow Summary Reports. The minimum, maximum, and average values are determined and recorded for a time period equal to the value entered in the **Sample** text box. The instrument must be in Power Flow Instrument Mode in order to obtain a Power Flow Summary Report.

The total Summary Report duration is calculated based on the sample period specified in the Sample text box and the amount of memory allocated to Summary Reports. The total Summary Report duration is displayed on the PE Software screen and is recalculated whenever the memory allocation or the sample period is changed. The total duration is displayed as the MAX duration. The Summary Report, if desired, can be transferred from the instrument before the duration has expired.

The Summary Report setup also includes a check box to indicate the desired standard (percent of fundamental or percent of RMS) to use for calculating Total Harmonic Distortion. If a "∏" appears in the check box, the Total Harmonic Distortion will be calculated based on percent of the fundamental; otherwise, the calculations will be based on the percent of RMS.

The minimum, maximum, and average values for all channels are continuously recorded until the memory allocated for Demand reports is full (unless **Enable memory overwrite** is on for the instrument - see section 5.4.).

Memory Allocation

Instrument memory can be allocated to each event type by typing the percent of total memory to be allocated for each event type in the **Memory: % of total** text box of each event control box. The mouse can also be used by "grabbing" the right edge of memory allocation bar and "dragging" the bar to its desired memory allocation percent. The mouse or the Tab key can be used to move between text boxes.

The value used in each text box is entered as a percent between 0 and 100. The bar graph display below the text box will graphically reflect the value entered by automatically changing the length of the display bar. For convenience, the total memory used for all events is calculated and displayed at the bottom of the Memory Setup screen. This total must not exceed 100% before you exit the Memory Setup screen. For convenience, the total number of reports (event occurrences that can be saved by the instrument) for each event type based on the specified memory allocation is displayed in the lower right-hand corner of the event display box.

If the total memory allocated is more than 100%, the PE Software will automatically display a **Setup Error** dialog box when you try to exit the Memory Setup screen or send the setups to the instrument. The **Setup Error** dialog box indicates that the memory allocation is greater than 100%, and allows the problem to be corrected in one of two ways: By selecting the **Modify the setup to a default value** button, the PE Software will automatically adjust the value(s) in question to the default value(s) until 100% memory allocation is not exceeded. Alternatively, the **Do not modify** setup button will close the **Setup Error** dialog box and return to the Memory Setup screen. The individual allocations can then be modified until the total does not exceed 100%. The Setup Error dialog box is shown in Figure 42.

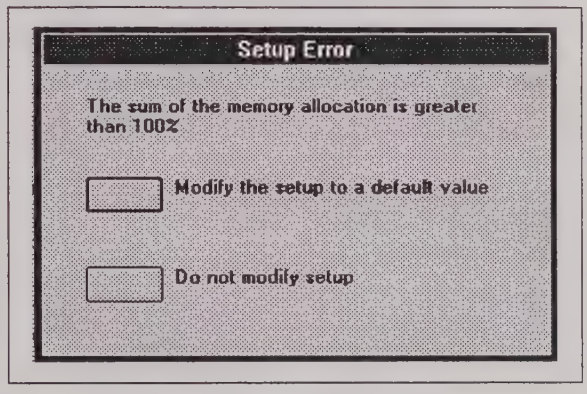

Figure 42: Setup Error Dialog Box

Setting Potential Transformer and Current Transformer Ratios

When using BMI power monitors with BMI-supplied clamp-on current probes and connecting directly to 600 Vrms or less, all reports and graphics are labeled with the actual current and voltage levels. When making indirect measurements using potential transformers (PTs) and non-BMI-supplied current transformers (CTs), the scaling factor due to the PT and CT must be accounted for in order to produce reports and graphs with the correct scales.

To define these PT and CT ratios, click on the **More** command box while in the Site Setup monitor. The PT and CT setup page shown in Figure 43 will be displayed. Note that while PT ratios for line voltage or CT ratios for line current must be the same, the PT ratio for neutral voltage and the CT ratio for neutral current can be different. This accommodates different sized PTs and CTs

to be used on the neutral for more accurate measurements on these values, which are typically much lower than line voltage and current values.

To set the PT and CT ratios, click on the left-hand box for the appropriate PT or CT. Then use the keyboard to input the primary ratio. Click on the right-hand box or press the Tab key, then use the keyboard to enter the secondary ratio. The default values are always 1 to 1, which is the correct setting for BMI-supplied CTs and direct voltage connections.

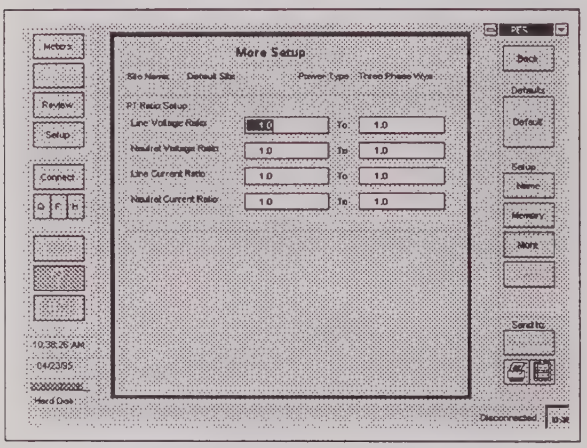

Figure 43: PT and CT Setup Screen

Setting the Power Analyzer Clock

While communications is enabled with an instrument using the Connect function, the clock in the monitoring instrument can be set using the Time command while in the Setup Site screen. Click on the Time command button to view the Instrument Time Setup screen, shown in Figure 44.

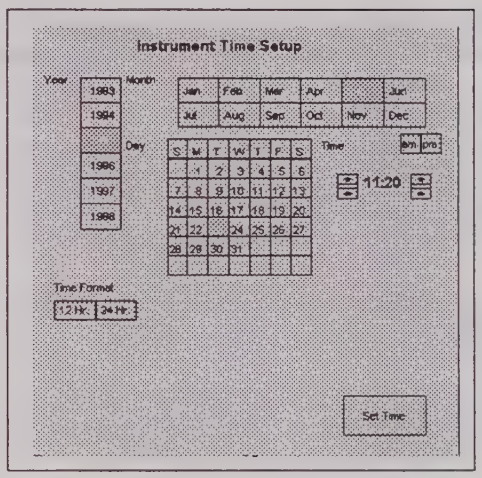

Figure 44: Instrument Time Setup Screen

Upon entering the screen, the current time and date of the PC is displayed. If this is correct, click on the Set Time command button with the mouse to set the time in the instrument to match.

If the time displayed is not correct, use the mouse to select 12 or 24 hour time format, year, month, and day. Use the up/down arrows to set the time, and select AM or PM if using a 12 hour time format. Then click on the Set Time command button to set the time in the instrument. See section 1.2.4. for more details on setting the date and time in the Instrument Time Setup screen.

Using Built-in Defaults

When using the PE Software for the first time, it may be helpful to use BMI defaults or to refer to them to help develop a sense of appropriate values for the many programmable functions of the power monitoring instrument.

To access these built-in default values, simply click on the **Default** command button at any point in the **Setup Site** menus. Default values for most of the individual text boxes are available through this command button and can be used as is or modified to reflect specific circumstances at the site to be monitored.

Sending the Setup Data to the Power Analyzer

After all of the site setup parameters have been defined, they can be sent to the instrument. Simply click on the **Send to Instrument** command button to upload the setup data to the instrument that is connected to the host PC via RS-232 or modem. See Chapter 2 for more information on connecting to a power analyzer.

Sending the Setup Data to the Printer

The print command box, represented by the printer icon in the lower right-hand corner of the display, can be used to print the site setup data for each site. The setup file will automatically be printed to the printer selected in the Windows control panel.

Sending the Setup Data to the Windows® Clipboard

To export the site setup data to another Windows application as a text file, click on the export command box, represented by the clipboard icon in the lower right-hand corner of the display. The text file will be copied into the Windows Clipboard, and from there can be pasted into other applications.

Setting Up Power Flow Software

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Retrieving and Reviewing Power Flow Data

Introduction

Instruments that are controlled by the PE Software monitor power and save demand and summary data independently. The data is maintained locally in each instrument until it is retrieved by the PE Software using an RS-232 or modem communications link.

The Data Transfer Function

To manually transfer data from an instrument into the PE Software, first establish a communications link between the instrument and the PC using the Connect function, described in Chapter 2.

After establishing a communications link, click on the **Review** mode command button to enter the data review screen. You must be in the **Review** screen to transfer data. The **Review** screen is shown in Figure 45.

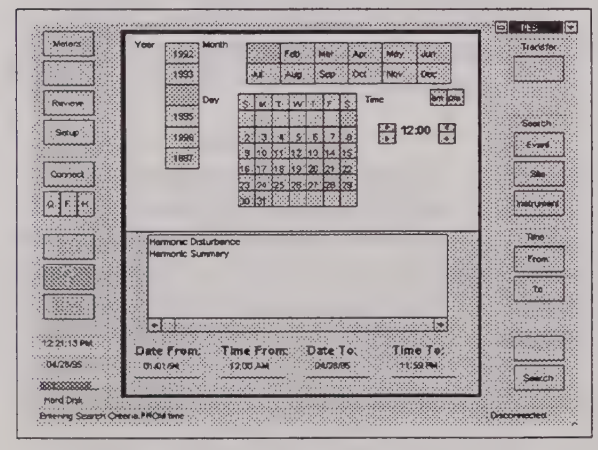

Figure 45: Review Screen

When the PE Software has established communications with an instrument using the **Connect** function, the Transfer function in the upper right-hand corner of the **Review** screen is enabled. Click on the **Transfer Start** command button to begin the data transfer from the instrument to the PE Software. The Communications Status Bar in the lower right-hand corner of the screen will indicate "**Transferring**" after the Start command is activated.

After the transfer has begun, the **Start** command button changes to **Stop**. To abort the transfer of data, click on the **Stop** command button.

Automatic Data Transfer

Setting Up the Auto-Download Schedule

The PE Software can be setup to automatically schedule instrument data transfers. To access the Auto-Download Schedule Setup, click on the **Download** button from the Right Toolbar while in the PE Software **Setup** mode. The Auto Download Setup screen is shown in Figure 46.

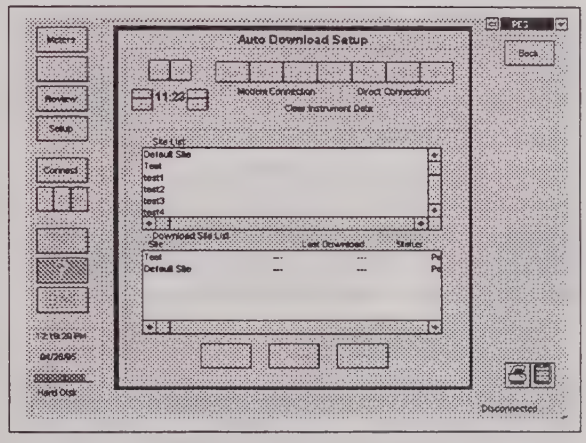

Figure 46: Auto Download Setup

The Auto-Download Schedule screen is broken into 3 sections. The top section of the screen contains controls for setting up a Site to auto-download, the middle section of screen contains a list box that contains the Site Names that have been entered with the PE Software, and the bottom section of the screen contains a list box containing the Site Names that are in the auto-download schedule and controls to add, remove, and reset a desired auto-download site(s).

To add a Site Name to the auto-download schedule select one or more Site Names from the PE Software site name list and select the **Add** button from the bottom section of the screen. Any Site Names that are not already in the auto-download schedule are added to the auto-download site list box in the bottom section of the screen.

Retrieving and Reviewing Power Flow Data

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To setup a Site Name(s) from the auto-download site list box, select the desired Site Name(s) by using the mouse. The current schedule setup will be reflected in the schedule setup controls in the top section of the screen.

The schedule setup controls include: time of day to download (only one scheduled download time can be specified), the days of the week to download, a check box to enable the clearing of the instrument data, and toggle check boxes to indicate the type of connection to make when downloading (RS-232 or modem). The same schedule setup can be entered for more than one Site Name. The PE Software will insure that any transfers that cannot be started when scheduled due to another transfer in progress will be marked as pending. The transfer will then start at the next available time that a connection can be made.

If the **Clear Instrument Data** check box is selected, data in the instrument will be deleted after it is downloaded into the host computer. If the box is cleared, then data can be download from an instrument without deleting the data in the instrument. This feature is useful in allowing one user to control and manage the database from one or more instruments, while allowing many users access to the data from multiple sites before it is downloaded into the database.

A Site Name(s) download schedule is entered by performing the following steps:

1) Enter the scheduled download time using the hour and minute scroll bars and the AM/PM buttons in the digital clock.

2) Enter the scheduled download days of the week by pressing the day of the week buttons. A day of the week button that is pressed indicates a day of the week that the instrument data will be transferred.

3) Select the connection type for the instrument, either direct connection or modem connection, from the connection type check boxes.

4) Select whether to clear the instrument data when the instrument data is transferred. A proper password must be entered to clear the instrument data.

The PE Software will create a log for each site in the auto-download list. The auto-download log contains a historical record of each auto-download that was scheduled. For each scheduled download the transfer status, transfer start time, transfer complete time, the total pass transfer count, the total error transfer count, and the schedule setup will be recorded in the auto-download log.

To remove a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Remove** button from the bottom section of the screen. This will remove the selected Site Name(s) from the auto-download schedule and delete the auto-download log for the site(s).

To reset a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Reset** button from the bottom section of the screen. This will delete the auto-download log for the site.

The auto-download Site List box also displays the last download that was scheduled and whether it passed or failed for each of the sites in the list box.

To print or copy the auto-download schedule and a log of the previous downloads as a text report, select the desired Site Name(s) from the download **Site List** (selecting none will print or copy all the logs) and click on the Print or **Copy** buttons from the right toolbar.

While the auto-download schedule setup screen is displayed, no transfers will be started. When an auto-download scheduled transfer is in process, the **Connect** button on the left toolbar is disabled. The current status of the auto-download schedule is displayed in the Communications Status Bar in the lower right-hand corner of the screen.

Reviewing Data From a Power Flow Monitor

To view events that have been collected from a power flow monitor(s), click on the **Review** mode button. The Review screen will appear as shown in Figure 47.

6

Retrieving and Reviewing Power Flow Data

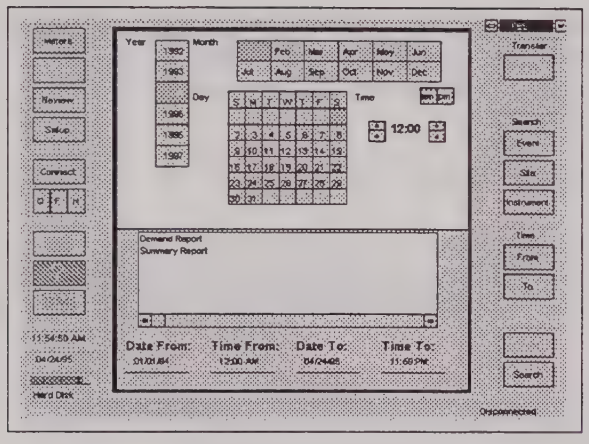

Figure 47: Review Data Screen

Review Mode Search Criteria

The Review mode allows you to search for and view demand and summary reports by site name and by instrument type for any time window. This advanced capability makes it practical for a single PE Software user to collect, sort, evaluate, analyze, and report on data even when using multiple instruments.

Creating a Search Time Window

The **From** and **To** Time command boxes are used in conjunction with the calendar and clock display to set a time window for the data you wish to view. To set up the time window, the beginning date and time and the ending date and time of the window must be specified. Select the **From** command button to specify the beginning of the time window. The **Date From:** and **Time From:** display at the bottom of the Review screen indicate the start date and time for the window. Use the mouse to change the start date by clicking on the year, month, and day calendars. Specify the start time by using the up/down arrows and the AM/PM buttons in the time display. Next, select the **To** command button, then repeat the calendar and time selection process for the end of the date and time window.

All reports that are viewed will have been generated during the date and time window specified using these criteria. As PC and instrument clocks may drift significantly from each other if they aren't set periodically, its a good idea to allow a margin of time around the desired time window when specifying the search time criteria.

Searching by Event Type, Site Name, and Instrument Type

After you have determined the search time window, you may wish to focus on either demand, summary or both for your search criteria.

Demand and summary reports can be singled out for review. Alternatively, both report types can be included in the event search criteria.

To choose the report(s) that you wish to include in the search criteria, click on the **Event** command button under the **Search** area of **Review** on the right-hand side of the screen. The dialog box in the center of the screen will list the report types available, as shown in Figure 48.

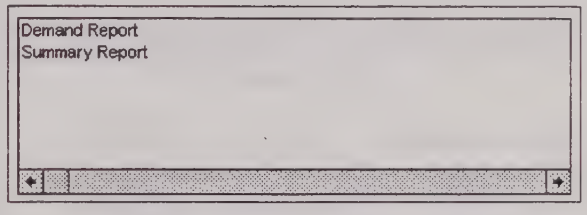

Figure 48: Event List

Click on the report type that you wish to include in the search. Select all of the report types by clicking and holding on the first one, then dragging down to the bottom of the list. The selected report(s) will be highlighted and included in the search.

As with report types, site names can also be selected to include in the search criteria. Click on the **Site** command button in the Review screen to produce the site list command box, as shown in Figure 49.

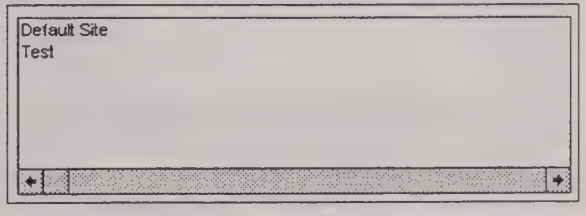

Figure 49: Site List

Retrieving and Reviewing Power Flow Data

Use the same procedures described in the previous paragraphs to select one or more site names from the list to include in the search criteria.

Finally, the instrument type to be included in the search criteria would be selected. However, as this version of PE Software supports only the BMI Model 7100, the instrument site is always selected. Click on the Instrument command button to view the instrument list, as shown in Figure 50.

Figure 50: Instrument List

Performing the Search

After the search time window, event type, site name, and instrument type search criteria have been specified, start the search by clicking on the **Search** command box. The event summary display will appear in the screen as shown in Figure 51.

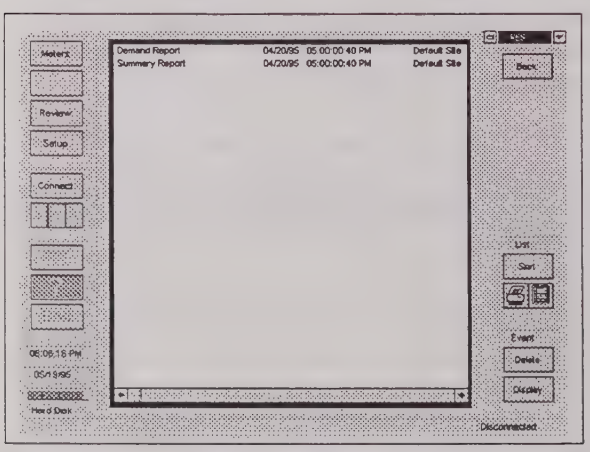

Figure 51: Event Summary

Deleting Reports

Reports that are not needed can be deleted from the PE Software database to free up disk space for other uses. To delete reports, click on report or click and drag on a group of reports in the event summary list. The reports that are selected will be highlighted. Click on the **Delete** command button to delete the highlighted report(s).

Sorting Reports

The event summary lists all reports that match the search criteria, sorted by site name, date, time, and report type. The order in which the reports are listed can be changed to any desired order.

To change the sorting order, click on the Sort command button. The **Sort Event List** dialog box will be displayed as shown in Figure 52.

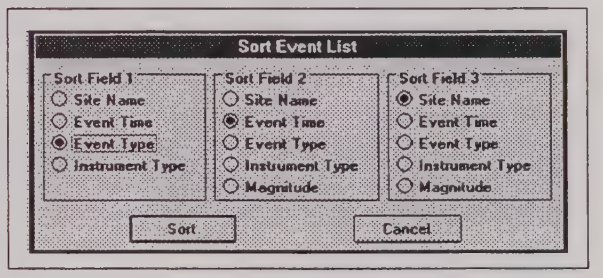

Figure 52: Sort Event List Dialog Box

Click on the radio button next to the **Site Name, Event Time, Event Type,** or **Instrument Type** in **Sort Field 1** to select the primary sorting preference. Select a radio button next to the desired sort criteria in **Sort Field 2** to set the secondary sorting preference and in **Sort Field 3** to set the tertiary sorting preference.

After the sorting preferences have been set, click on the Sort command button. The PE Software will resort and re-display the event summary. Click on the **Cancel** command button at any time to abort the sort and return to the **Review** screen.

Displaying Reports

To view the reports, click or click and drag on a report or group of reports in the event summary list to highlight the events you wish to see. Then click on the **Display** command button. The event (or first event in the group) will be displayed as shown in Figure 53.

6 Retrieving and Reviewing Power Flow Data

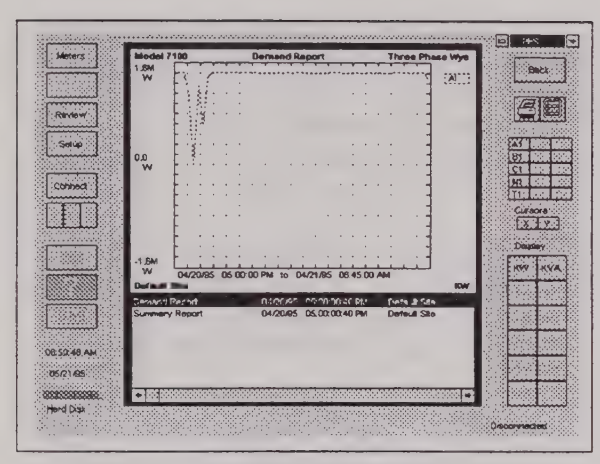

Figure 53: Event Display

The elements of the event display are shown in Figure 54. The screen consists of the actual event display, which contains a scale and event information text, and Right Toolbar that contains buttons to select desired display channels, select the X and Y cursors, and to print and copy to clipboard a displayed event. The bottom of the Right Toolbar also contains Power Flow Report Type buttons that control the display contents.

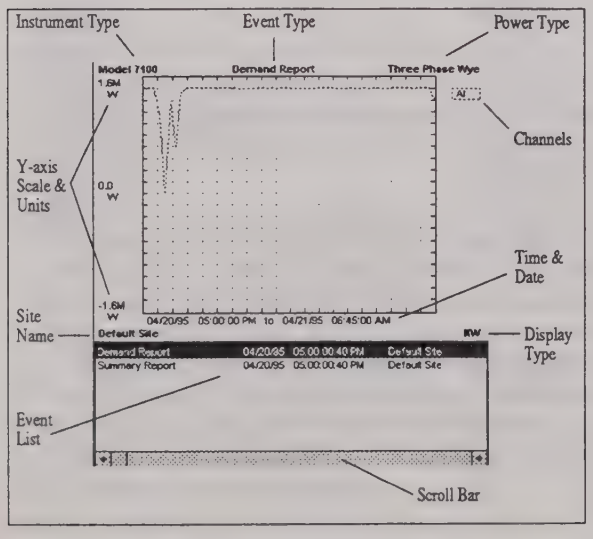

Figure 54: Elements of the Event Display

The Power Flow Report type buttons are defined as follows:

Button	Report	
Demand Report	W	Watt-hours
Demand Report	VA	Volt-amp hours
Summary Report	W	Watts
Summary Report	VA	Volt-amps
Summary Report	Vrms	RMS Voltage
Summary Report	Irms	RMS Current
Summary Report	PF	True Power Factor
Summary Report	dPF	Displacement Power Factor
Summary Report	Vthd	Voltage THD
Summary Report	Ithd	Current THD
Summary Report	VAR	Volt-amps reactive

The following table shows the channels that are enabled for each Power Flow Report for each power type, where the channel notation is defined as follows:

A - Phase A
B - Phase B
C - Phase C
N - Phase N
T - Total

	Single Phase	Dual Single Phase	3-Phase Delta	3-Phase Wye
W*	AN	ABNT	T	ABCNT
VA*	AN	ABNT	T	ABCNT
W	AN	ABNT	T	ABCNT
VA	AN	ABNT	T	ABCNT
Vrms	AN	ABNT	ABCT	ABCNT
Irms	AN	ABNT	ABCT	ABCNT
PF	AN	ABN	T	ABCN
dPF*	A	AB	T	ABC
VAR*	AN	ABNT	T	ABC
Vthd*	AN	ABN	ABC	ABCN
Ithd*	AN	ABN	ABC	ABCN

*Displays as single-line trace when reviewing

Switching Between Events

To view different events while in the event display, double-click on the event you wish to see in the event list. That event will then appear in the display window.

Retrieving and Reviewing Power Flow Data

If the event you wish to view is not in the display window, click on the **Back** command button. The original event summary will be displayed. Highlight the event(s) you wish to review, then click on the Display button to reenter the event display.

Selection of Phases

When the event is initially displayed in the event display, the voltage channel which first triggered will be the channel displayed. It may often be desirable to view all voltage channels, all current channels, or the voltage and current from a single channel simultaneously.

Additional channels can be added to the display or removed from the display by clicking on the channel buttons in the middle of the right side of the display. The channel buttons are shown in Figure 55. As each channel is added to the display, the color key for that channel appears in the upper right-hand corner of the display.

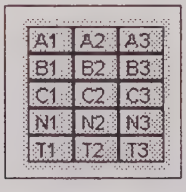

Figure 55: Channel Buttons

Using the Cursors to Measure Events

To measure the voltage, current, or time events in the event display accurately, the PE Software supports X- and Y-axis cursors, similar to modern digitizing oscilloscope displays. These cursors can be positioned with the mouse and the corresponding differential values read in the bottom of the display.

To use the X- and Y-axis cursors, click on the X and Y Cursor command boxes. The cursors will appear in the display and the event list in the bottom of the display will be replaced by the cursor information, as shown in Figure 56.

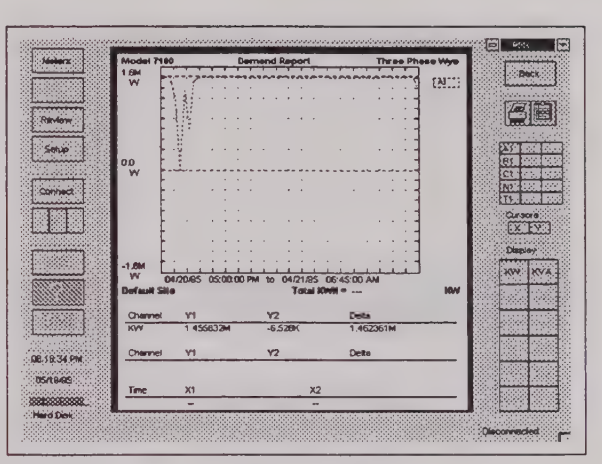

Figure 56: X- and Y-axis Cursors

To move the cursors, click and hold each cursor with the mouse while dragging it to the desired location in the display.

Zooming Display Events

Since the PC display has a resolution that may be far less then the resolution at which the instrument samples the event data, the PE Software provides a zooming function to display the event data in greater detail.

There are no command boxes needed to perform this function. To zoom in on a portion of the event display, the left mouse button is used to create and define a zooming region. This is similar to zooming procedures found in PC drawing or CAD software packages.

To zoom in on the event display, place the mouse cursor at the upper left corner of the region of the event to be zoomed. Hold down and drag the left mouse button. A dotted rectangle defining the zoom region will be displayed, with the cursor changing to a magnifying glass containing a '+' in it. Release the left mouse button when the desired zoom region has been established. A minimum zoom region of 20 by 20 display pixels is allowed by the PE Software.

6 Retrieving and Reviewing Power Flow Data

If an invalid zoom region is selected, an error beep will sound. Once zoomed, the event display will be redrawn with new voltage, current, and time scales. Once the event display has been zoomed, the cursor will be displayed as a magnifying glass containing a '-' in it to remind you that the event display is not full scale. Zooming can be performed multiple times.

To unzoom the event display, click the right mouse button anywhere in the display.

Reviewing Demand Reports

To review Demand Reports created using the PE Software power flow option, click on the **Review** and **F** mode boxes in the left hand side of the display. Follow the directions for retrieving data and searching for events discussed in previous sections, then display a Demand Report. A sample Demand Report is shown in Figure 57.

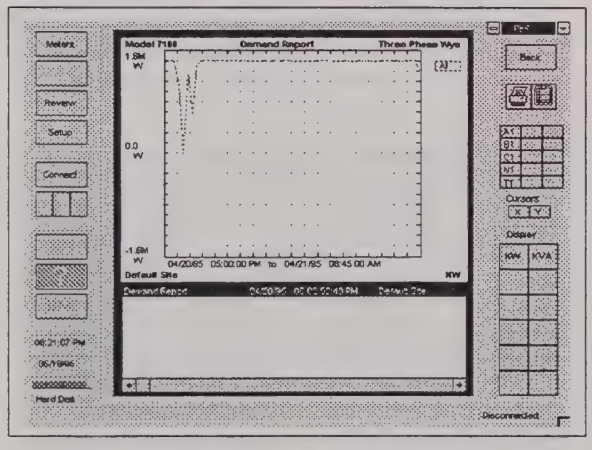

Figure 57: Demand Report

Either kWH and kVAH can be displayed in the window. The kWH and kVAH calculations are performed on a per channel and a total basis. One or more channels and the total value for all phases can be viewed by clicking on the appropriate channel buttons in the right-hand side of the display.

While viewing a Demand Report, Fixed or Sliding Demand Intervals can be specified. To set a specific demand interval, click on a blank area of the display using the left mouse button. The Demand Report Options dialog box will be displayed as shown in Figure 58.

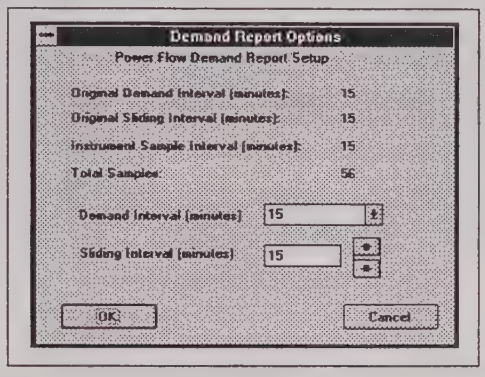

Figure 58: Demand Report Options

To specify a **fixed demand interval**, click on the Fixed Demand Interval control box. The demand interval can then be entered in the Interval text box using the keyboard or the up/down arrows to the right of the text box. The fixed demand interval can be between 15 and 60 minutes in one-minute increments.

To specify a sliding demand interval, click on the **Sliding Demand Interval** control box. The interval time from 15 to 60 minutes can then be entered in the Interval text box, and the slide time from 5 and 10 minutes can be entered in the **Sliding** text box.

After clicking on the **OK** button, the Demand Report will display demand data with the specified demand intervals.

Note that a gap in the displayed data indicates the instrument wasn't collecting data for that period of time.

Reviewing Summary Reports

To review Summary Reports created using the PE Software power flow option, click on the **Review** and **F** mode boxes in the left hand side of the display. Follow the directions for retrieving data and searching for events discussed in previous sections, then display a Summary Report. A sample Summary Report is shown in Figure 59.

Retrieving and Reviewing Power Flow Data

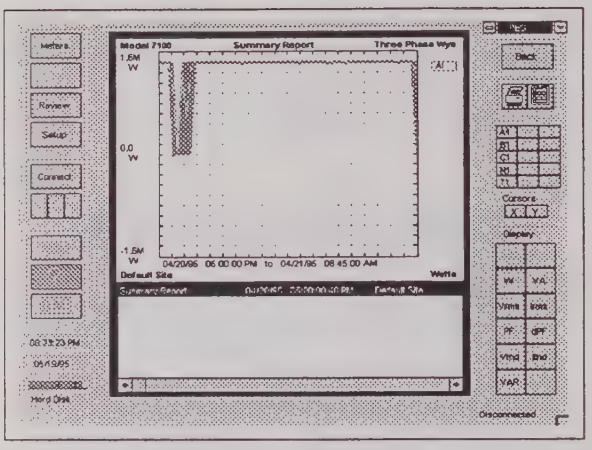

Figure 59: Summary Report

Either W, VA, VAR, Vrms, Irms, PF, dPF, Vthd or Ithd can be displayed in the window. The display can include these quantities on a per channel and a total basis. One or more channels and the total value for all phases can be viewed by clicking on the appropriate channel buttons in the right-hand side of the display.

Minimum, maximum, and average data is displayed for the intervals defined in the Setup mode. The zoom feature can be used to enlarge a specific area of the graph for a higher resolution display.

Note that a gap in the displayed data indicates that no data was collected for that time period.

7 Setting Up Harmonics Software

Introduction

Before Harmonics software can be used to analyze power, site-specific information must be defined for the instrument. The site name, harmonics limits, and memory allocation are all defined in this Site Setup operation. To access the Site Setup, click on the Site command box while in the PES Setup mode. Select the Harmonics mode by clicking on the H mode button on the left-hand command bar.

Name Setup - Adding a New Harmonics Monitor to the Database

The Name Setup screen, shown in Figure 60, is the first screen to appear when you enter the PE Software Setup Site mode. This screen can also be accessed from other screens within Setup Site by clicking on the Name menu button. The Name Setup screen is used to define the name for a specific instrument at a given site, the type of instrument that is being used, the power type, country, system frequency, and voltage. If modems are being used to communicate with the instrument, the phone number and modem initialization information are specified here, also.

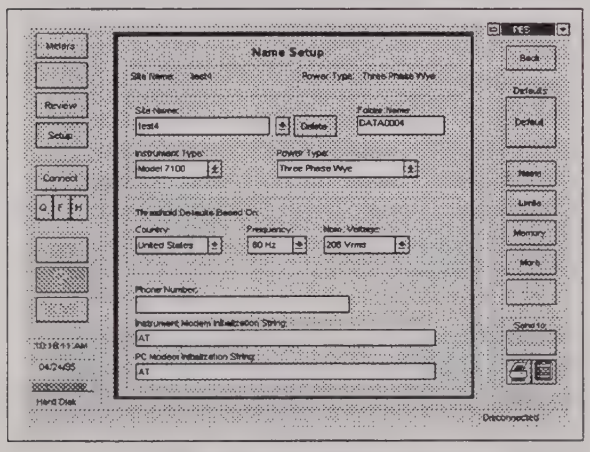

Figure 60: Name Setup Screen

To define a site name, use the mouse to click on the **Site Name** text box. Then type in a name up to 30 alpha-numeric characters in length. The PE Software automatically creates a file directory under the root directory **BMI_DATA** to store information collected by the instrument using this site name. The file directory name assigned by the PE Software appears in the **Folder Name** text box. The contents of this box cannot be edited by the user.

If you wish to select a site name that has already been defined, click on the down-scroll arrow next to the **Site Name** text box. A list box containing previously-defined site names appears in the window. Click on the site name you wish to use. The PE Software automatically closes the **Site Name** list box and displays the information for the selected site in the **Name Setup** text boxes. The memory selections are also restored to those previously defined for the site.

The **Instrument Type** box is used to select the type of instrument that will be used at the defined Site Name. This version of PE Software supports only the BMI Model 7100 power analyzer.

The **Power Type** text box contains a list of the power types that the instrument can be connected to. The power type selections available include none, single phase, split single phase, three phase wye, three phase delta, and crazy legged delta. Use the mouse to select the power type for the site in the **Site Name** text box.

The PE Software will automatically assign default settings based on the information specified in the **Power Type**, **Frequency**, and **Nom.** (nominal) **Voltage** text boxes. Use the mouse to select the country, frequency, and nominal voltage for the instrument in the **Site Name** text box.

If you are using modems to communicate with the instrument specified in the Site Name text box, type in the phone number for the instrument in the **Phone Number** text box. Modem initialization strings for the modem in the host computer and the instrument may be typed in to the **Instrument Modem Initialization String** and **PC Modem Initialization String** text boxes. These strings are used to initialize the modems every time communications is attempted with an instrument, allowing one PC modem to be used to communicate with different types of instrument modems. Refer to the user's guide for your modem to determine what initialization strings, if any, are required for communications using PE Software.

Setting Up Harmonics Software

7

Harmonics Measurement Functions

The Harmonics software option for PE Software allows the BMI 7100 to function as a harmonics analyzer. Limits can be set for total harmonic distortion (THD), as well as for individual harmonics. Harmonics can be calculated as a percentage of the fundamental (in accordance with IEEE 519) or as a percentage of total RMS (in accordance with IEC 555). Harmonics summary recording is also available.

Harmonic calculations can be made using one cycle of data or four cycles of data. When harmonic thresholds are exceeded, waveshapes are captured on all channels. The number of cycles that are captured are equal to the setting for the number of cycles of data for which harmonic calculations are performed, either one or four cycles.

Setting Harmonic Limits

When the PE Software is in the **H** mode, the **Limits Setup** screen is used to define thresholds for capturing waveshapes when the harmonics exceed defined levels. To access the **Limits Setup** screen, use the mouse to click on the **Limits** box from the **Setup Site** screen. The **Harmonic Limits Setup** screen will appear as shown in Figure 61.

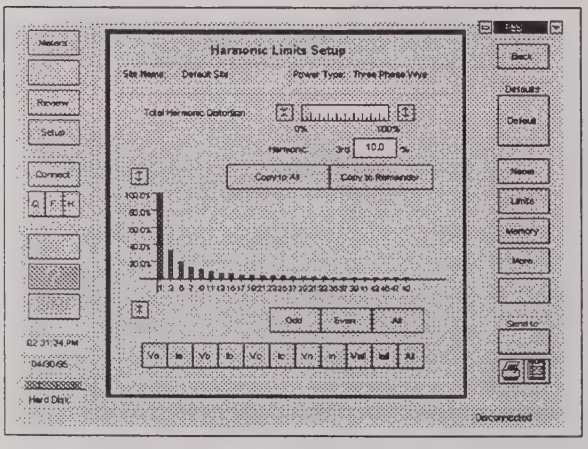

Figure 61: Harmonics Limits Setup Screen

Harmonics Limits Setup Screen

The Harmonic Limits Setup screen is used to set trigger thresholds for harmonics calculations. If a threshold is exceeded, then waveshapes are captured on all channels.

Thresholds can be set for total harmonic distortion as well as only odd harmonics, only even harmonics, or for both odd and even harmonics.

To set the threshold limit for total harmonic distortion, drag the bar in the **Total Harmonic Distortion** bar graph display to the desired limit. The Total Harmonic Distortion bar graph can display from 0% to 1000% THD in seven ranges. To change the range of the display of the bar graph for the best resolution, click on the arrow control boxes on the left and right of the display. The left box will decrease the range displayed, and the right box will increase the range displayed. The available ranges are 1%, 5%, 10%, 50%, 100%, 500%, and 1000%.

While you change the THD limit using the bar graph, the precise value will be displayed in the **Harmonic** text box. The desired harmonic limit can be typed directly into this text box as an alternative method of setting the limit.

To set the thresholds for the individual harmonics, first select the **Odd**, **Even**, or **All** command box directly below the harmonic spectrum display in the center of the screen. If you select the **Odd** command box, only the odd harmonics will be displayed in the harmonic spectrum graph. Likewise, the **Even** command box will display just the even harmonics, while the **All** command box will display all harmonics.

After selecting odd, even, or all harmonics, select the channel(s) on which you wish to set the harmonics limits. For maximum flexibility, you can select any individual channel (**Va, Vb, Vc, Vn, Ia, Ib, Ic, or In**), all voltage channels (**Vall**), all current channels (**Iall**), or all voltage and current channels (**All**).

7 Setting Up Harmonics Software

Next set the harmonic limit for each harmonic in the display by using the mouse to click and hold on each individual harmonic in the bar graph display and move it to the desired limit. The actual limit will be displayed in the **Harmonic** text box. Alternatively, you can click on the individual harmonic in the display, then enter the limit for that harmonic directly in the **Harmonic** text box using the keyboard. Continue until all harmonic limits have been set for all channels on which you wish to acquire data.

The range of the bar graph display can be changed from 1% to 1000% in seven ranges using the arrow control boxes at the top and bottom of the Y-axis. Simply click on the control boxes using the mouse to increase or decrease the range of the display.

If a threshold is set that is at or exceeds the full range of the display, a "+" will appear in the bar near the top of the display.

The **Copy to All** and **Copy to Remainder** command boxes are useful when a single threshold value is used for many different harmonics. To use these commands, first set threshold for any harmonic to the desired level. Clicking on the **Copy to All** command box will set all thresholds to this level for the selected harmonics (**Odd, Even, All**) on the selected channel(s) (Va, Ia, Vall, All, etc.). Alternatively, clicking on the **Copy to Remainder** command box will set all thresholds for harmonics above the harmonic number listed to the left of the Harmonic: % text box to this level for the selected harmonics on the selected channel(s).

Harmonics Memory Setup

The Harmonics Memory Setup screen is used to determine which channels will have harmonics calculations performed, how the harmonics will be calculated, whether limits will be compared for odd, even, or both odd and even harmonics, and how the total available memory will be allocated between harmonic disturbance snapshots and harmonic summaries.

To access the Harmonics Memory Setup screen, click on the **Memory** command box on the right-hand side of the display while in the **Setup H** mode. The Harmonics Memory Setup display will appear as shown in Figure 62.

Harmonics can be calculated as a percentage of the fundamental RMS value (the IEEE 519 method) by clicking on the % of

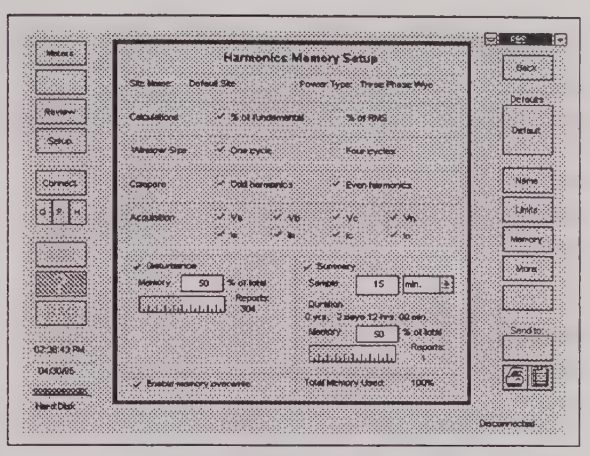

Figure 62: Harmonics Memory Setup

fundamental check box in the **Calculations** command box. A "∏" in the box means that it is selected. Alternatively, to calculate harmonics as a percentage of the total RMS value (the IEC 555 method) click on the % of **RMS** box.

Harmonics can be calculated using one cycle of sampled data (128 points) or using 4 cycles of sampled data (512 points) by clicking on the **One cycle** or **Four** cycles check box in the **Window Size** command box.

As most power systems only have odd harmonics present, you may wish to ignore the even harmonics. By clicking on the **Odd harmonics** and **Even harmonics** check boxes in the **Compare** command box, you can enable or disable harmonic disturbance monitoring for either odd, even, or both odd and even harmonics.

Harmonics calculations for disturbance and summary reports can be performed on one or more acquisition channels. Click on the individual channel check boxes in the **Acquisition** command box to enable or disable calculations for each channel.

Enabling and Disabling Event and Summary Data Recording
The recording of each event type can be individually enabled or disabled entirely. To enable the recording of an event type, click on the control box next to the event type name. If a "∏" or a "**T**" appears in the box, then events of this type will be recorded by the instrument after the setups are sent to the instrument. If the box is empty, the instrument will be instructed to ignore all events of this type.

In addition to enabling and disabling the recording of events, you may optionally choose to record only text data for impulse and RMS events. If a "T" appears in the control box next to Impulses and RMS Disturbances, waveshape data will not be saved, making more memory available for the recording of additional impulses, RMS disturbances, or available to other event types. A "∏" in the control box means that waveshape data will be recorded for the event.

Memory Allocation

Instrument memory can be allocated to Disturbance data and Summary data by typing the per cent of total memory to be allocated for each event type in the **Memory: % of total** text box of each event control box. The mouse or the **Tab** key can be used to move between boxes. The number entered into each text box can be between 0 and 100.

The bar graph display below the text box will graphically reflect the value entered by automatically changing the length of the bar. The amount of memory allocated to each event type can alternatively be modified by clicking and holding on the right-most edge of the bar in the bar graph display, then dragging the bar to the desired percentage. The **Memory: % of total** text box will automatically display the value as it is changed this way. For convenience, the total memory used for all events is tallied and displayed at the bottom of the **Memory Setup** screen. This total must equal 100% or less before you exit the Memory Setup screen. Also for convenience, the total number of reports of each type that can be recorded based on the memory allocation for that report is displayed in the lower right-hand corner of the event display box.

If the total memory allocated is more than 100%, the PE Software will automatically display a **Setup Error** dialog box, shown in Figure 63, when you try to exit the **Memory Setup** screen or send the setups to the instrument.

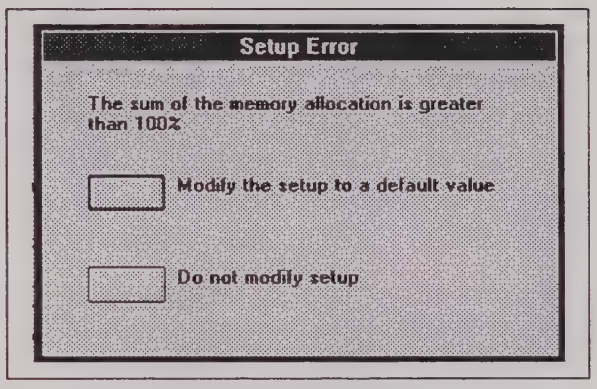

Figure 63: Setup Error Dialog Box

The **Setup Error** dialog box states that the memory allocation is greater than 100%, and allows you correct the problem in one of two ways. By selecting the **Modify the setup** to a default value command box, the PE Software will automatically adjust the values for all memory allocation text boxes to default values that total 100%.

The **Do not modify setup** command button will close the **Setup Error** dialog box and return to the **Memory Setup** screen. The individual allocations can then be modified until the total equals 100%.

BMI monitoring instruments will collect data until the memory allocated for each event type becomes full. If the **Enable memory overwrite** control box is not selected, then recording for each event type will stop when the allocated memory is used up. If a "∏" appears in the control box, then event recording will continue, overwriting the existing data on a first-in, first-out basis.

Setting Potential Transformer and Current Transformer Ratios

When using BMI power monitors with BMI-supplied clamp-on current probes and connecting directly to 600 Vrms or less, all reports and graphics are labeled with the actual current and voltage levels. When making indirect measurements using potential transformers (PTs) and non-BMI-supplied current transformers (CTs), the scaling factor due to the PT and CT must be accounted for in order to produce reports and graphs with the correct scales.

7 Setting Up Harmonics Software

To define these PT and CT ratios, click on the **More** command box while in the Site Setup monitor. The PT and CT setup page shown in Figure 64 will be displayed. Note that while PT ratios for line voltage or CT ratios for line current must be the same, the PT ratio for neutral voltage and the CT ratio for neutral current can be different. This accommodates different sized PTs and CTs to be used on the neutral for more accurate measurements on these values, which are typically much lower than line voltage and current values.

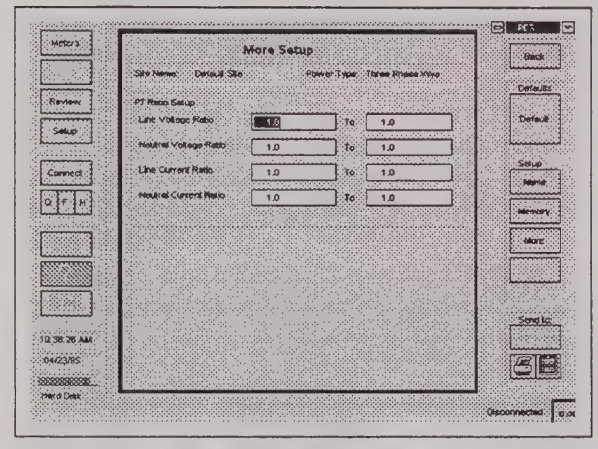

Figure 64: PT and CT Setup Screen

To set the PT and CT ratios, click on the left-hand box for the appropriate PT or CT. Then use the keyboard to input the primary ratio. Click on the right-hand box or press the Tab key, then use the keyboard to enter the secondary ratio. The default values are always 1 to 1, which is the correct setting for BMI-supplied CTs and direct voltage connections.

Setting the Power Analyzer Clock

While communications is enabled with an instrument using the Connect function, the clock in the monitoring instrument can be set using the **Time** command while in the Setup Site screen. Click on the **Time** command button to view the Instrument Time Setup screen, shown in Figure 65.

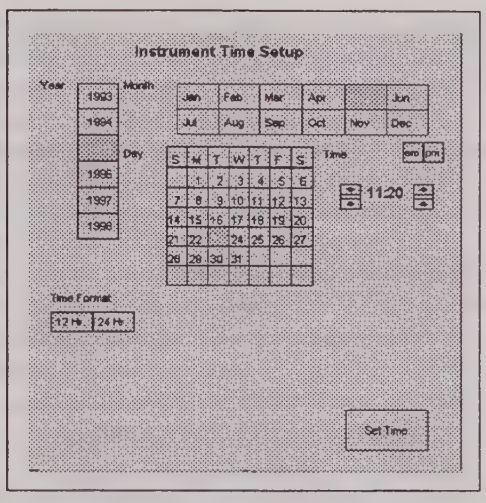

Figure 65: Instrument Time Setup Screen

Upon entering the screen, the current time and date of the PC is displayed. If this is correct, click on the **Set Time** command button with the mouse to set the time in the instrument to match.

If the time displayed is not correct, use the mouse to select 12 or 24 hour time format, year, month, and day. Use the up/down arrows to set the time, and select AM or PM if using a 12 hour time format. Then click on the **Set Time** command button to set the time in the instrument. See Chapter 1 for more details on setting the date and time in the Instrument Time Setup screen.

Using Built-in Defaults

When using the PE Software for the first time, it may be helpful to use BMI defaults or to refer to them to help develop a sense of appropriate values for the many programmable functions of the power monitoring instrument.

To access these built-in default values, simply click on the **Default** command button at any point in the **Setup Site** menus. Default values for most of the individual text boxes are available through this command button and can be used as is or modified to reflect specific circumstances at the site to be monitored.

Sending the Setup Data to the Power Analyzer

After all of the site setup parameters have been defined, they can be sent to the instrument. Simply click on the Send to Instrument command button to upload the setup data to the instrument that is connected to the host PC via RS-232 or modem. See Chapter 2 for more information on connecting to a power analyzer.

Sending the Setup Data to the Printer

The print command box, represented by the printer icon in the lower right-hand corner of the display, can be used to print the site setup data for each site. The setup file will automatically be printed to the printer selected in the Windows control panel.

Sending the Setup Data to the Windows® Clipboard

To export the site setup data to another Windows application as a text file, click on the export command box, represented by the clipboard icon in the lower right-hand corner of the display. The text file will be copied into the Windows Clipboard, and from there can be pasted into other applications.

8 Reviewing Harmonics Disturbances and Summary Reports

Introduction

Instruments that are controlled by the PE Software monitor power and save demand and summary data independently. The data is maintained locally in each instrument until it is retrieved by the PE Software using an RS-232 or modem communications link.

The Data Transfer Function

To manually transfer data from an instrument into the PE Software, first establish a communications link between the instrument and the PC using the **Connect** function, described in Chapter 2.

After establishing a communications link, click on the Review mode command button to enter the data review screen. You must be in the **Review** screen to transfer data. The **Review** screen is shown in Figure 66.

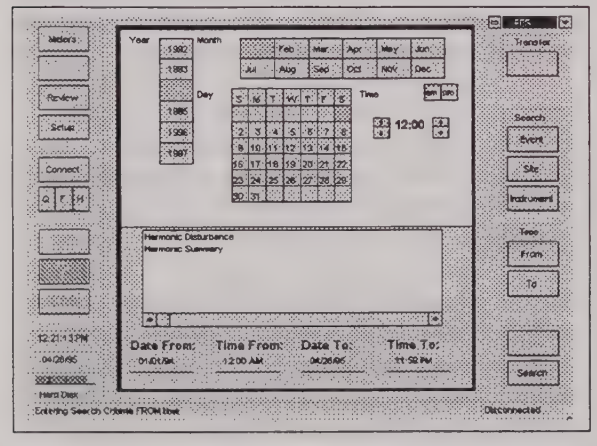

Figure 66: Review Screen

When the PE Software has established communications with an instrument using the **Connect** function, the **Transfer** function in the upper right-hand corner of the **Review** screen is enabled. Click on the **Transfer Start** command button to begin the data transfer from the instrument to the PE Software. The Communications Status Bar in the lower right-hand corner of the screen will indicate "**Transferring**" after the **Start** command is activated.

After the transfer has begun, the **Start** command button changes to Stop. To abort the transfer of data, click on the **Stop** command button.

Automatic Data Transfer

Setting Up the Auto-Download Schedule

The PE Software can be setup to automatically schedule instrument data transfers. To access the Auto-Download Schedule Setup, click on the **Download** button from the Right Toolbar while in the PE Software **Setup** mode. The Auto Download Setup screen is shown in Figure 67.

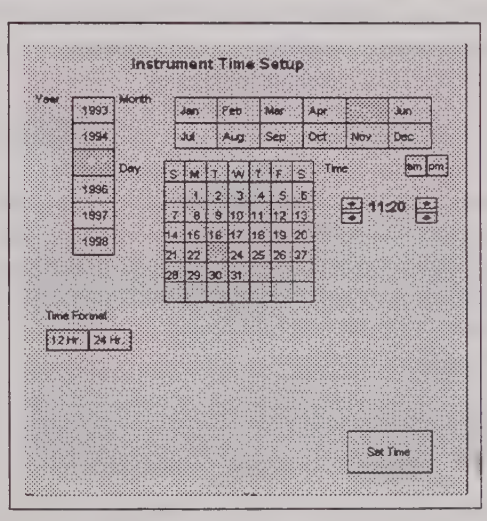

Figure 67: Auto Download Setup

The Auto-Download Schedule screen is broken into 3 sections. The top section of the screen contains controls for setting up a Site to auto-download, the middle section of screen contains a list box that contains the Site Names that have been entered with the PE Software, and the bottom section of the screen contains a list box containing the Site Names that are in the auto-download schedule and controls to add, remove, and reset a desired auto-download site(s).

To add a Site Name to the auto-download schedule select one or more Site Names from the PE Software site name list and select the **Add** button from the bottom section of the screen. Any Site Names that are not already in the auto-download schedule are added to the auto-download site list box in the bottom section of the screen.

Reviewing Harmonics Disturbances and Summary Reports

8

To setup a Site Name(s) from the auto-download site list box, select the desired Site Name(s) by using the mouse. The current schedule setup will be reflected in the schedule setup controls in the top section of the screen.

The schedule setup controls include: time of day to download (only one scheduled download time can be specified), the days of the week to download, a check box to enable the clearing of the instrument data, and toggle check boxes to indicate the type of connection to make when downloading (RS-232 or modem). The same schedule setup can be entered for more than one Site Name. The PE Software will insure that any transfers that cannot be started when scheduled due to another transfer in progress will be marked as pending. The transfer will then start at the next available time that a connection can be made.

If the **Clear Instrument Data** check box is selected, data in the instrument will be deleted after it is downloaded into the host computer. If the box is cleared, then data can be download from an instrument without deleting the data in the instrument. This feature is useful in allowing one user to control and manage the database from one or more instruments, while allowing many users access to the data from multiple sites before it is downloaded into the database.

A Site Name(s) download schedule is entered by performing the following steps:

1) Enter the scheduled download time using the hour and minute scroll bars and the AM/PM buttons in the digital clock.

2) Enter the scheduled download days of the week by pressing the day of the week buttons. A day of the week button that is pressed indicates a day of the week that the instrument data will be transferred.

3) Select the connection type for the instrument, either direct connection or modem connection, from the connection type check boxes.

4) Select whether to clear the instrument data when the instrument data is transferred. A proper password must be entered to clear the instrument data.

The PE Software will create a log for each site in the auto-download list. The auto-download log contains a historical record of each auto-download that was scheduled. For each scheduled download the transfer status, transfer start time, transfer complete time, the total pass transfer count, the total error transfer count, and the schedule setup will be recorded in the auto-download log.

To remove a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Remove** button from the bottom section of the screen. This will remove the selected Site Name(s) from the auto-download schedule and delete the auto-download log for the site(s).

To reset a Site Name from the auto-download schedule, select one or more Site Names from the download **Site List** and select the **Reset** button from the bottom section of the screen. This will delete the auto-download log for the site.

The auto-download **Site List** box also displays the last download that was scheduled and whether it passed or failed for each of the sites in the list box.

To print or copy the auto-download schedule and a log of the previous downloads as a text report, select the desired Site Name(s) from the download **Site List** (selecting none will print or copy all the logs) and click on the **Print** or **Copy** buttons from the right toolbar.

While the auto-download schedule setup screen is displayed, no transfers will be started. When an auto-download scheduled transfer is in process, the **Connect** button on the left toolbar is disabled. The current status of the auto-download schedule is displayed in the Communications Status Bar in the lower right-hand corner of the screen.

Reviewing Data From a Power Analyzer

To view events that have been collected from a analyzer(s), click on the Review mode button. The Review screen will appear as shown in Figure 68.

8 Reviewing Harmonics Disturbances and Summary Reports

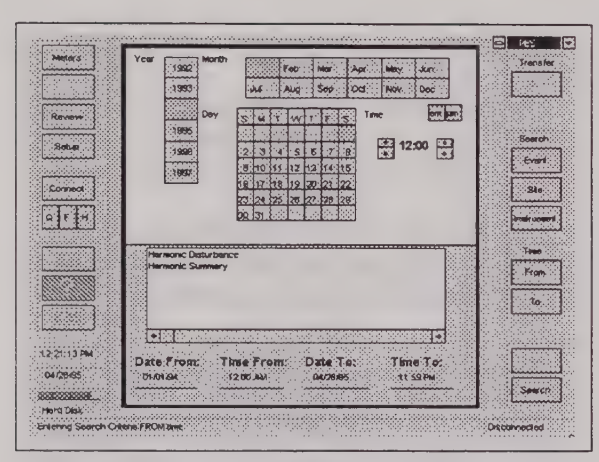

Figure 68: Reveiw Data Screen

Review Mode Search Criteria

The Review mode allows you to search for and view demand and summary reports by site name and by instrument type for any time window. This advanced capability makes it practical for a single PE Software user to collect, sort, evaluate, analyze, and report on data even when using multiple instruments.

Creating a Search Time Window

The **From** and **To** Time command boxes are used in conjunction with the calendar and clock display to set a time window for the data you wish to view. To set up the time window, the beginning date and time and the ending date and time of the window must be specified. Select the From command button to specify the beginning of the time window. The **Date From:** and **Time From:** display at the bottom of the Review screen indicate the start date and time for the window. Use the mouse to change the start date by clicking on the year, month, and day calendars. Specify the start time by using the up/down arrows and the AM/PM buttons in the time display. Next, select the To command button, then repeat the calendar and time selection process for the end of the date and time window.

All reports that are viewed will have been generated during the date and time window specified using these criteria. As PC and instrument clocks may drift significantly from each other if they aren't set periodically, its a good idea to allow a margin of time around the desired time window when specifying the search time criteria.

Searching by Event Type, Site Name, and Instrument Type

After you have determined the search time window, you may wish to focus on either demand, summary or both for your search criteria.

Demand and summary reports can be singled out for review. Alternatively, both report types can be included in the event search criteria.

To choose the report(s) that you wish to include in the search criteria, click on the Event command button under the Search area of Review on the right-hand side of the screen. The dialog box in the center of the screen will list the report types available, as shown in Figure 69.

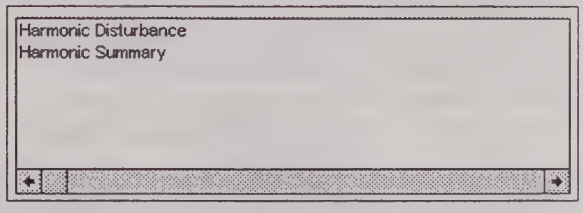

Figure 69: Event List

Click on the report type that you wish to include in the search. Select all of the report types by clicking and holding on the first one, then dragging down to the bottom of the list. The selected report(s) will be highlighted and included in the search.

As with report types, site names can also be selected to include in the search criteria. Click on the Site command button in the Review screen to produce the site list command box, as shown in Figure 70.

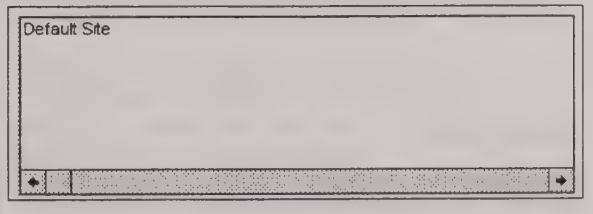

Figure 70: Site List

Use the same procedures described in the previous paragraphs to select one or more site names from the list to include in the search criteria.

Reviewing Harmonics Disturbances and Summary Reports

Finally, the instrument type to be included in the search criteria would be selected. However, as this version of PE Software supports only the BMI Model 7100, the instrument site is always selected. Click on the **Instrument** command button to view the instrument list, as shown in Figure 71.

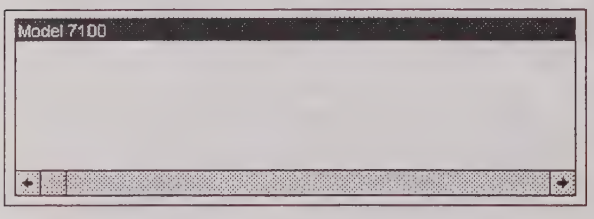

Figure 71: Instrument List

Performing the Search

After the search time window, event type, site name, and instrument type search criteria have been specified, start the search by clicking on the Search command box. The event summary display will appear in the screen as shown in Figure 72.

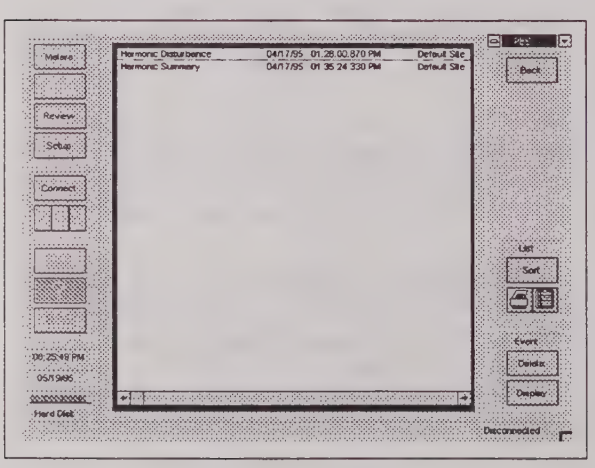

Figure 72: Event Summary

Deleting Events

Events that are not needed can be deleted from the PE Software database to free up disk space for other uses. To delete events, click on an event or click and drag on a group of events in the event summary list. The events that are selected will be highlighted. Click on the **Delete** command button to delete the highlighted event(s).

Sorting Events

The event summary lists all events that match the search criteria, sorted by site name, date, time, and event type. The order in which the events are listed can be changed to any desired order.

To change the sorting order, click on the **Sort** command button. The **Sort Event List** dialog box will be displayed as shown in Figure 73.

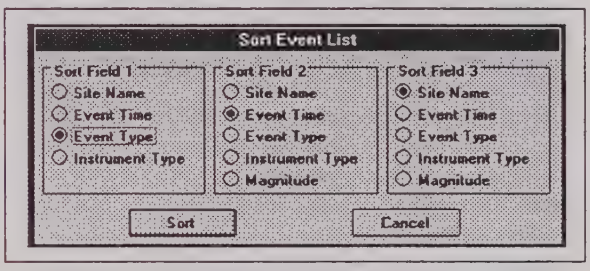

Figure 73: Sort Event List Dialog Box

Click on the radio button next to the **Site Name, Event Time, Event Type,** or **Instrument Type** in **Sort Field 1** to select the primary sorting preference. Select a radio button next to the desired sort criteria in **Sort Field 2** to set the secondary sorting preference and in **Sort Field 3** to set the tertiary sorting preference.

After the sorting preferences have been set, click on the **Sort** command button. The PE Software will resort and re-display the event summary. Click on the **Cancel** command button at any time to abort the sort and return to the **Review** screen.

Displaying Events

To view the events, click or click and drag on an event or group of events in the event summary list to highlight the events you wish to see. Then click on the **Display** command button. The event (or first event in the group) will be displayed as shown in Figure 74.

8 Reviewing Harmonics Disturbances and Summary Reports

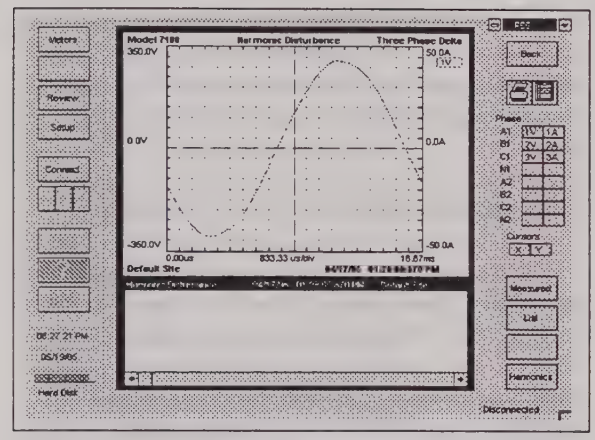

Figure 74: Event Display

The elements of the event display are shown in Figure 75.

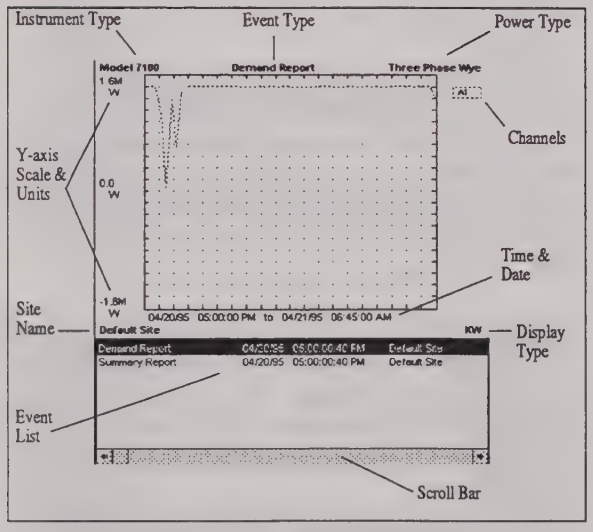

Figure 75: Elements of Event Display

Switching Between Events

To view different events while in the event display, double-click on the event you wish to see in the event list. That event will then appear in the display window.

If the event you wish to view is not in the display window, click on the **Back** command button. The original event summary will be displayed. Highlight the event(s) you wish to review, then click on the **Display** button to reenter the event display.

Selection of Phases

When the event is initially displayed in the event display, the voltage channel which first triggered will be the channel displayed. It may often be desirable to view all voltage channels, all current channels, or the voltage and current from a single channel simultaneously.

Additional channels can be added to the display or removed from the display by clicking on the channel buttons in the middle of the right side of the display. The channel buttons are shown in Figure 76. As each channel is added to the display, the color key for that channel appears in the upper right-hand corner of the display.

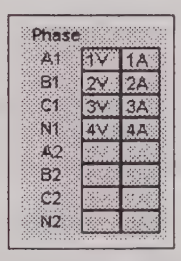

Figure 76: Channel Buttons

Using the Cursors to Measure Events

To measure the voltage, current, or time events in the event display accurately, the PE Software supports X- and Y-axis cursors, similar to modern digitizing oscilloscope displays. These cursors can be positioned with the mouse and the corresponding differential values read in the bottom of the display.

To use the X- and Y-axis cursors, click on the X and Y Cursor command boxes. The cursors will appear in the display and the event list in the bottom of the display will be replaced by the cursor information, as shown in Figure 77.

Reviewing Harmonics Disturbances and Summary Reports

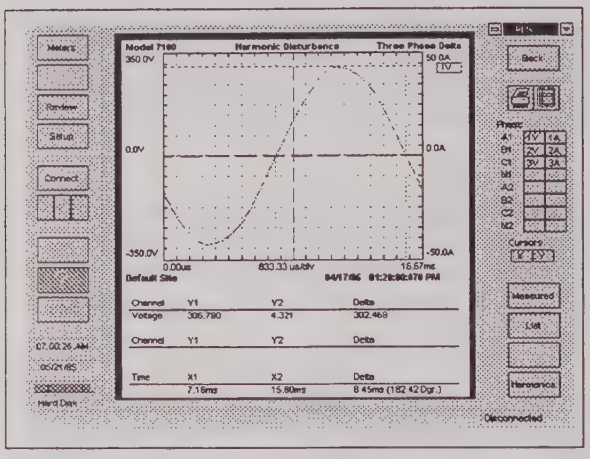

Figure 77: X- and Y-axis Cursors

To move the cursors, click and hold each cursor with the mouse while dragging it to the desired location in the display.

Zooming Display Events

Since the PC display has a resolution that may be far less then the resolution at which the instrument samples the event data, the PE Software provides a zooming function to display the event data in greater detail.

There are no command boxes needed to perform this function. To zoom in on a portion of the event display, the left mouse button is used to create and define a zooming region. This is similar to zooming procedures found in PC drawing or CAD software packages.

To zoom in on the event display, place the mouse cursor at the upper left corner of the region of the event to be zoomed. Hold down and drag the left mouse button. A dotted rectangle defining the zoom region will be displayed, with the cursor changing to a magnifying glass containing a '+' in it. Release the left mouse button when the desired zoom region has been established. A minimum zoom region of 20 by 20 display pixels is allowed by the PE Software.

If an invalid zoom region is selected, an error beep will sound. Once zoomed, the event display will be redrawn with new voltage, current, and time scales. Once the event display has been zoomed, the cursor will be displayed as a magnifying glass containing a '-' in it to remind you that the event display is not full scale. Zooming can be performed multiple times. To unzoom the event display, click the right mouse button anywhere in the display.

Reviewing Harmonics Disturbance Reports

When a harmonics threshold is exceeded, waveshapes are captured for all channels that are active while monitoring in the harmonics mode. The number of cycles captured for each channel is equal to the Window Size specified in the **Harmonics Memory Setup** screen. If one cycle is specified, then one cycle of data will be captured. If four cycles are specified, then four cycles of data will be captured.

To review Harmonic Disturbances created using the PE Software harmonic option, click on the **Review** and **H** mode boxes in the left hand side of the display.

The top half of the display screen shows the captured waveform(s) for which a harmonic limit was exceeded. Press the **Harmonics** command button to see a harmonics spectrum graph for the waveform. The graph will appear in the bottom of the display. Likewise, press the **Measured** command button to see a text listing of the THD, total odd and even harmonics, and the individual harmonics.

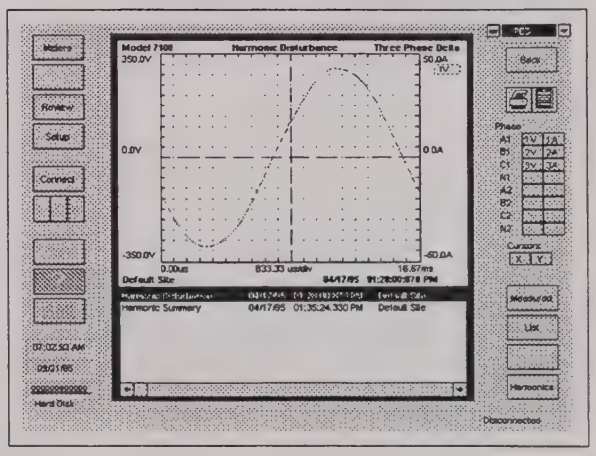

Figure 78: Harmonic Disturbance

8 Reviewing Harmonics Disturbances and Summary Reports

Reviewing Harmonics Summary Reports

The minimum and maximum harmonics levels over time are recorded in the Harmonics Summary reports. The recording interval is specified in the harmonics setup.
To review Harmonic Summary reports created using the PE Software harmonics option, click on the **Review** and **H** mode boxes in the left-hand side of the display. Follow the directions for retrieving data and searching for events discussed in the previous sections, then display a Harmonic Summary report. A Harmonic Summary report is shown in Figure 79.

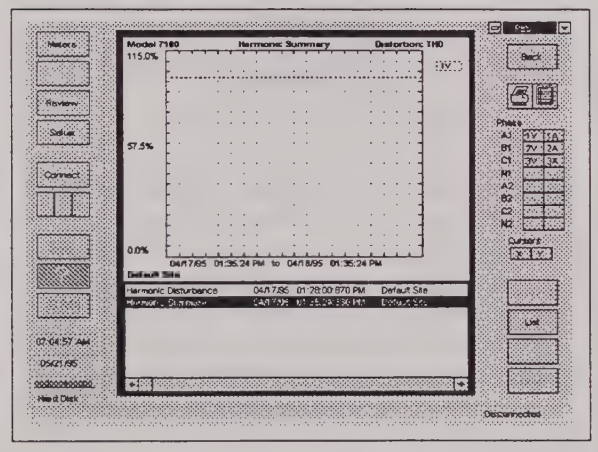

Figure 79: Harmonic Summary

The Harmonic Summary report initially shows the THD for the time period of the report. To view individual harmonics, click in the empty space of the display outside of the graph area with the left mouse button. The **Harmonic Summary Display Options** dialog box will appear in the screen as shown in Figure 80.

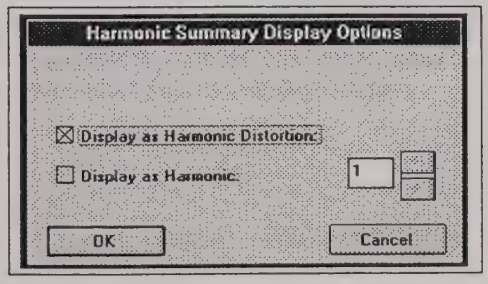

Figure 80: Harmonic Summary Display Options

To view an individual harmonic, click on the **Display as Harmonic** option box, then select the harmonic number you wish to view in the text box. The minimum and maximum Harmonics Summary for that harmonic will then be displayed.

Reviewing Harmonics Disturbances and Summary Reports

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9 Printing, Copying, and Exporting Power Analyzer Graphs and Data

Introduction

The event display, including the cursor information or Harmonic Spectrum, can be printed to the current Windows printer or can be copied to the Windows clipboard for importing into other documents. The raw event data can also be exported to Microsoft Excel or other spreadsheet applications. The Print button and Copy/Export buttons are represented by icons displaying a printer and a clipboard, respectively. These buttons are located at the top of the Right Toolbar in the Event Display screen. The Print and Copy/Export icons are shown in Figure 81.

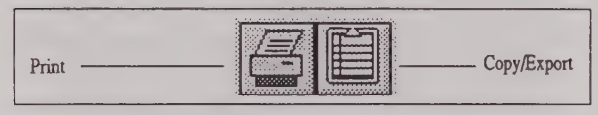

Figure 81: Print and Copy/Export Icons

To print the current event display, click on the Print button from the Right Toolbar while in the Event Display screen. The event display will automatically be printed to the default printer selected in your Windows control panel. If the colors of the channels to not appear to print with enough contrast, the PE Software can be displayed using Printer default colors as specified in the PES Color Setup and the PES Channel Setup. A color printer may also be used for better clarity and contrast.

To copy the current event display to the clipboard, click on the Copy/Export button from the Right Toolbar while in the Event Display screen. The PES Export Options dialog box will be displayed. The **Export Drawing to Windows Clipboard** button can be selected to export the event data into the Windows clipboard in Windows Metafile format, and can be pasted into any Windows word processor or editor supporting the Metafile format (Microsoft Paintbrush does not support the Metafile format). The Windows Metafile format allows the pasted image to be scaled and cropped, allowing the image to maintain the proper X and Y aspect ratios, which minimizes the image distortion.

Exporting Event Data to Microsoft Excel or Other Application

To export the raw event data, click on the Copy button from the Right Toolbar while in the Event Display screen. The Export Options dialog box will be displayed, as shown in Figure 82. The **Export data to Microsoft Excel or other** application button can be selected to export the raw event data. This will display the PES Data Export dialog box, in which the spreadsheet row number, column letter, and sheet can be specified for exporting the data. The PES Data Export dialog box is shown in Figure 83.

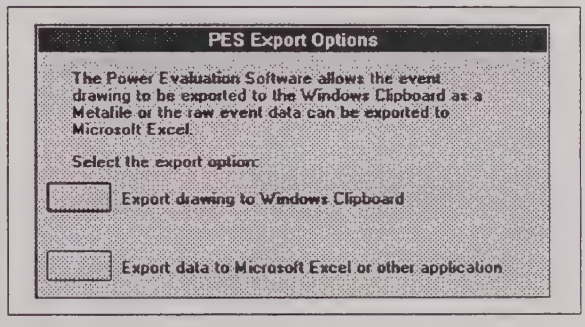
PES Export Options
The Power Evaluation Software allows the event drawing to be exported to the Windows Clipboard as a Metafile or the raw event data can be exported to Microsoft Excel.
Select the export option:
Export drawing to Windows Clipboard
Export data to Microsoft Excel or other application

Figure 82: PES Export Options

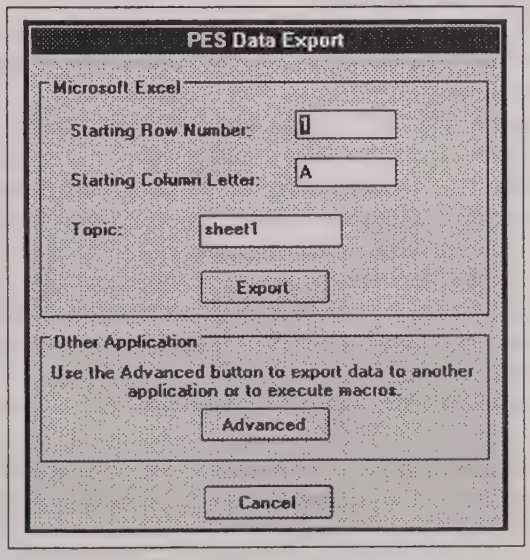

Figure 83: PES Data Export

Printing, Copying, and Exporting Power Analyzer Graphs and Data

The PES Data Export dialog box contains controls to directly communicate with Microsoft Excel and controls to communicate with other spreadsheet applications. The PE Software communicates with the spreadsheet applications using Windows Dynamic Data Exchange (DDE).

To export the event data to Microsoft Excel, enter the spreadsheet row number in the **Starting Row Number** text box, enter the spreadsheet column letter (from A to ZZ) in the **Starting Column Letter** text box, and the sheet name in the **Topic** text box. Then press the Export button in the PES Data Export dialog box. If the Microsoft Excel application can be started by the PE Software it will automatically start the application and minimize it at the bottom of the Windows' desktop. If the Microsoft Excel application cannot be started by the PE Software, an error message will be displayed. The Microsoft Excel application must be then be started manually, and raw event data will then be exported to the spreadsheet. It should be noted that due to the limitations of DDE, the amount of time required to export the data will vary from event to event, depending on the length of the event data to be exported. While the event data is being exported, the status bar will display the message **'Exporting Data....'** and the PES Data Export dialog box controls will be disabled. Once the event data is completely exported the Export dialog box will be removed from the screen.

To export the event data to another spreadsheet application, start the application and minimize it on the Windows desktop. Then press the **Advanced** button in the Export dialog box. The PES Advanced Data Export dialog box will be displayed, as shown in Figure 84. Enter the applications name in the **Service** text box, enter the spreadsheet row number in the **Starting Row Number** text box, enter the spreadsheet column letter (from A to ZZ) in the **Starting Column Letter** text box, and the sheet name in the Topic text box. Press the **Connect** button in the PES Advanced Data Export dialog box to connect to the desired application. A successful connection to the spreadsheet application must be made for the **Export** button to be enabled. An error message will be displayed if the PE Software cannot connect with the spreadsheet application. Once a successful connection has been established, press the **Export** button in the Advanced Export dialog box to export the data.

The Advanced Export dialog box also contains a text box and **Execute** button to run spreadsheet macros to a connected application. Consult your spreadsheet manual for the format of its macros when using DDE.

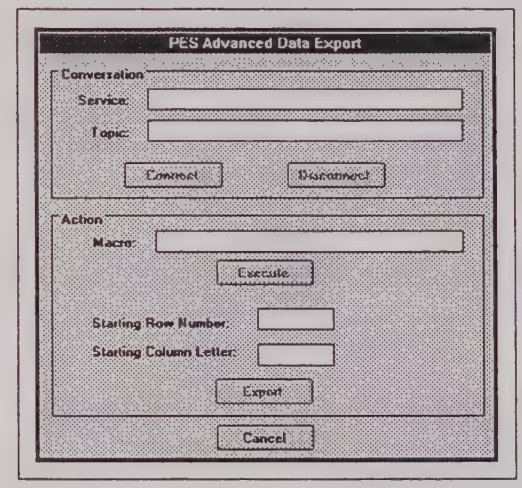

Figure 84: PES Advanced Data Export Dialog Box

10 Managing a Database

Introduction

When PE Software is loaded onto a PC, a DOS root directory called **bmi_data** is created. Event data from all instruments are stored under this directory. This directory can be viewed by using the DOS **dir** command or by using the Windows File Manager program. Refer to your DOS or Windows user's guide for more information on viewing directories.

The PE Software Directory Structure

When new site names are created using the **Setup Site Name** setup function, a directory is created under the **bmi_data** directory to store all of the event data transferred from the power monitor with that site name to the host PC. Each unique site name has a unique directory created for it.

The PE Software Filename Convention

A partial directory listing for the C:\ drive using the Windows File Manager is shown in Figure 85.

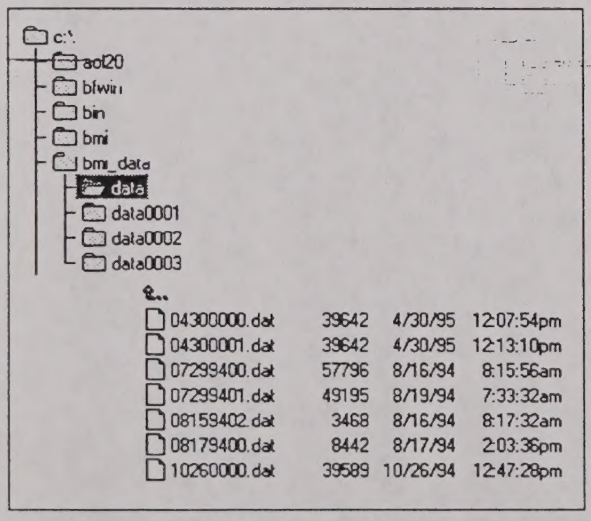

Figure 85: File Manager Directory Listing

Under the **bmi_data** directory, directories are listed whose names all start with data, followed by four numbers. Each of these directories was created when a new site name was defined in the PE Software **Setup Site Name** function.

The files for the data directory are also shown in figure 85. Each of these files represents one data transfer from the power monitor to the host PC. The size of each file is listed, and the date and time in the file directory indicates when the data transfer took place.

Each directory contains the data for a single site name. The directory name associated with a site name can be determined using the **Name Setup** screen in the **Site Setup** function. When the site name is displayed in the **Site Name:** text box, the corresponding directory name for that site is displayed in the **Folder Name:** text box.

The **Site Name** and **Folder Name** text boxes are shown in Figure 86.

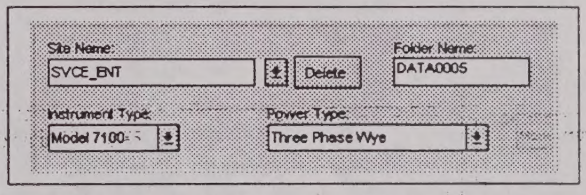

Figure 86: Directory Name Reference

This illustrates that the directory name that corresponds to the site name **SVCE_ENT** is **DATA0005**.

Archiving Historical Power Analyzer Data

It's a good practice to periodically back-up all of the PE Software site data on your PC to maintain a source of the data in the event of a hard disk failure. Standard copy routines supported in DOS and Windows can be used to copy the data directories in the **bmi_data** root directory to a floppy disk, tape drive, magneto-optical drive, or file server.

Power Evaluation Software Database Maintenance

In addition to periodically backing up the data collected using PE Software, standard database management practices should be observed. Obviously, if the hard drive where the bmi_data directory is located becomes full, additional data can't be transferred from the power monitors. It's good practice to pay attention to the Disk Status Display in the PE Software screen and archive, then delete older data files periodically.

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